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IN TIMES TO COME

THERE is real news to report this month. "Jason Sows Again", our new Burt's serial, reached the office so late that we could not announce it. But, beginning next month, when "Jason Sows Again" concludes, a new serial starts that we've really been waiting for. Thomas Calvert McClary is back. "Rebirth", the most-mentioned story we have published perhaps, is to have a successor, though not a sequel. It will be a three-part serial, beginning in the April issue, and bringing a story as dramatic, as filled with incident, and as noteworthy as was "Rebirth".

THAT is one of the big items of news. But there are three more. The second is that Dr. Edward E. Smith will be with us in the May issue — with his first article. It is an article on a subject that only Dr. Smith could handle with the sweep and majesty it deserves — the creation of the Solar System in the collision of two monstrous furnaces — stars. That comes in May, rather than April, because in the next issue, Herbert C. McKay presents an article which will occupy as much space as Dr. Smith's long article will. McKay has done an article on polarized light that proved to me that I didn't know half as much about the subject as I thought. And — it is unusual in that it will be copiously illustrated, with more than a dozen accurately made cuts. If the ancient maxim of a thousand words to a picture be true, it is an 18,000 word article.

AND the third, and perhaps most important item is this: Jack Williamson has submitted an outline for a story to be called "The Legion of Probability." It isn't finished, and I can't be certain until it is — but I think Williamson is going to be the author of our first new-concept material story. He's a corking good author under any circumstances, but he has a completely new concept to work on, and I'm expecting another, really great serial from him. I hope that can start in the May issue too.

The Editor.

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GREGORY CROSS might have escaped the weird compulsion of the thing by racing back toward his laboratory. But he did not do so.

Why? Hope was the cause—hope backed up by grim, fearful necessity. He had been born on an Earth whose people seemed doomed to extinction by a Sun that shed three times as much heat and light on his native planet as it should have.

Forty years ago the catastrophe had begun. A tremendous cloud of meteoric refuse had drifted into the solar system from the interstellar regions. Quickly the cloud had been drawn into the Sun, adding to its bulk and stirring up its fires.

The increased solar mass meant increased solar gravity, which tugged more powerfully at the encircling worlds, narrowing their orbits, and drawing them closer to the central holocaust. The changes which had taken place in the Sun, unlike a passing noval explosion, were permanent.

In the periscope globe, Ganymede dwindled swiftly.

Something From Jupiter

by Dow Elstar

*An Earthman fights for his planet among the alien
life-forms of an ammonia world.*



Earth had become an alternately parched and scalded waste, to which a few humans still clung, doggedly, and with full knowledge that, barring miracles in which they no longer believed, their extinction was decreed.

But hope, even in the blackest of circumstances, is an emotion that is easily aroused. Thus Gregory Cross looked out into the hot, steamy night with a strange exaltation thrilling his pulses. Might he not find, in the science of another planet, the means to help his people?

Five minutes ago he had seen the missile trace a glowing, meteoric path through the atmosphere. But its speed had been swiftly checked by something more effective than mere friction with the air. It had linded, almost lightly, like a half-deflated balloon, five hundred yards away, where the hills loomed up toward the murky stars and gathering clouds.

Gregory Cross could not truly have said that he knew what the thing was; yet he was aware of its origin. Not without results had he been receiving and sending code signals impressed on a fine vibration of the ether, differing in no respect from the all-pervading cosmic rays of space. By the representation of simple forms and pictures in a graph-type code, he had been able to teach the unknowns across the void a slight knowledge of English. From their crude, uncertain messages, he had been able to grasp a hazy idea of some vast need which was theirs. The sensitive, movable coils of his direction-finders had told him beyond question that the messages came from, or from the vicinity of, the planet that now gleamed dully in the south. It was Jupiter, a world with physical characteristics as different from those of Earth, as the vacuum of space differs from the ocean depths.

FOR three weeks now, Cross had been receiving a series of dot-and-dash

signals which spelled over and over again a single word: "Coming! Coming! Coming!" And so he was not too surprised that this promise of alien visitation had become fact.

The compulsion of the thing was new to him, however, and suggested sinister elements. It was not like the compulsion of hypnotism. Rather, it was as though some invisible impulses were clutching at the motor nerves of his body, urging his legs to move at a rapid run toward where the missile from far beyond Terrestrial boundaries had landed.

And though he felt the icy touch of terror at this demonstration of eerie neurotic science, he made no effort to resist its call. Forward he hurried, allowing his limbs to function under the commands of a mind other than his own, wild hope overbalancing his fears.

And so, presently, he stood before the missile. There were occasional rumbles of thunder now, and flashes of lightning. By the brief flickers of illumination, he saw what the object was. It was a sphere, gray and dusty in hue, like the parched and lifeless soil under his feet. This strange Something from Jupiter was covered with the oxide of metal burnt in the frictional heat of swift passage through the atmosphere. It still exuded a reeking, cindery warmth, and within it there were faint, whispering, clicking sounds of contraction.

For a minute Gregory Cross stood motionless in the weird night, waiting for whatever was to happen next. In that minute the wind rose out of the stillness, making a sad, lonely whisper across the sky, and causing his ragged shirt to whip about him. A few big, scalding raindrops plopped in the dust at his feet. Others struck the sphere, and hissed into puffs of steam. Once, Greg Cross glanced back toward his isolated laboratory, whose steel roof, fitted with vacuum compartments as a

protection against the awful solar heat, hunched like a dim monster in the gloom.

Then, with scarcely a sound, the great globe broke into halves like a clamshell, its hemispheres still hinged together, their dividing faces turned upward.

This event, however, offered little in the way of revelation. There was a hollow space at the center of each opposing hemisphere; and though the thick metal all around might hide intricate mechanical complexities, nothing of it could be seen.

Greg half expected to hear tinkling bell-like notes beating out a few words in code, but none came. None, in fact, were needed. For the weird compulsion supplied all the commands that were necessary. Now that Greg was so close to this alien fabrication, the compelling impulses it emitted were far too strong for any human will to resist.

With a kind of dull resignation, he watched his feet step within the hollow of one of the hemispheres. Like one carried along impassively by some one else, he felt his body double itself up into an embryonic position in the cavity. Then the other hemisphere folded over upon him like a lid. Infinite darkness enveloped Gregory Cross. The sounds of the rising storm were blotted out as if turned off by a switch. For many minutes the silence endured.

BUT THEN there was a sense of sudden movement—sudden thrusting, crushing, upward motion—mingled with the thin, muffled scream of speed-tortured air.

"Going to Jupiter," Greg thought vaguely. "I'm going to Jupiter!"

And his mental processes rushed on, elaborating and straightening out his scattered ideas: "This globe must be guided and operated by remote control," he muttered. "It has to be, because evidently, I'm the only living thing inside it— Jupiter, huge and cold— No man could live there for a second

without artificial aids. Yet it has people—intelligent people! Wonder what they're like? Wonder what they want with me? The word 'help' was in many of their messages. But what sort of help do they need? And how could a Terrestrial aid them, anyway?"

Greg thought of the compulsion that had gripped him. It was gone now, but a placidity, a fatalism that deadened worry remained. He could move his limbs freely within the limits imposed by the metal walls around him. But then, of course, here inside this tiny space there was no necessity to maintain the commanding spell over his nerves and muscles. He was effective and completely a captive without the compulsion.

A captive? There was no reason to suppose that any bond of real sympathy might ever exist between the dominant life-forms of two utterly different worlds. He was being transported to some, almost unimaginable hell. He'd never see Earth again! Aid for his own people from another planet. Bah! It had been insane even to hope!

He felt cold. His body tingled with a thousand electrical prickles. His senses were dimming. Was the coma he was falling into suspended animation or real death? His thoughts were blotted out in growing twilight—

II.

GREGORY CROSS' first sensation, on awakening, was one of crushing weight. He was lying on his back on some hard and slightly curved surface. There was a fluid wetness around him, and he heard a gurgle like that of water going down a drain. Mingled with this sound, there was a distant and mighty sobbing, like that of some tremendous tempest. Greg had no remembrance of the passage of time. He could not know whether months, or only hours, had gone by since he had last been conscious.

What he saw when he opened his

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Science Fiction



SOMETHING FROM JUPITER By Dave Kobliner

eyes was not exactly a room. Rooms were rectangular, while this compartment was spherical. It was perhaps ten feet across, enormously braced. It was bare of appointments except that, from the domelike curve above him, complicated grids hung suspended, almost touching his face. There was a fading heatless glow, reddish and dim, in those grids. Through small holes near Greg the last few quarts of some kind of liquid was draining. It seemed that recently the entire compartment had been flooded.

Greg crept tediously out from beneath the grids. "This is Jupiter," he thought dully. "This is the prison that they—the Jovians—have locked me in."

Oddly, he wanted to laugh. But he checked the impulse, knowing that in that direction lay hysteria and madness.

He looked at the arcing sides of the globular chamber. Its walls were translucent, and through them an eldritch, flickering light sifted, now bluish, now gray, now savage, dazzling white. That flickering illumination was like lightning. The crashing rumbles that went with it, blending with the muffled and vibrant howl of a Jovian hurricane, could be thunder.

Presently Greg discovered the nature of the translucence of the walls around him. They were meant to be transparent, but on their inner surface a rime of whitish crystals was forming. Frost? Probably, for the cold out there beyond this compartment must be terrific. Funny that he didn't feel cold. Just comfortable instead. It was all rather puzzling. Guessing the truth was still a bit beyond him. He could not know that that frost—that congealed, Earthly water—had recently been part of his own flesh!

"Hello!" he shouted. "Where is everybody?" His voice echoed loud and brittle and strange in the narrow confines of the chamber.

There was no answer, other than a

soft rustle beyond the wall, down low and to his right. Greg scrambled to the place whence the sound seemed to issue and with his fingers tried to loosen a little circle of the frost. It felt almost hot to his touch. Yet he did not speculate upon the incredible implications of this fact now. For there was something else to hold his attention.

THE FROST rubbed away, revealing a crystal-clear substance beyond. Before the latter was filmed over with ice crystals again, Greg saw, through the thick, transparent substance, a half dozen gray-white arms, which seemed almost as fragile as pipestems. Lightning flickered beyond the creature to which they belonged, glinting on its queer body with reflected sparks of cold fire, like a mass of opaque ice sprinkled with the dust of tarnished silver. Little, suckerlike discs, terminating the boneless appendages at the ends of the arms, flattened against the glassy material.

Savagely, moved by mingled fascination and horror, Greg Cross scraped the frost away from his little spy window once more. Eyes confronted him now—three eyes that glistened at him like the highlights on a glossy stalactite at the other side of a dark cave. They looked like faceted bits of diamond, behind which burned an intense, purposeful thought. Deep in horny hollow of an odd, whitish-gray exoskeletal armor, those orbs were set. Over each were bright, red markings which Greg was to remember.

The monster was clearly not meant to walk erect like a man, but to crawl with its short, flat body in a horizontal position, like that of a millipede. Yet there was a distinction between its numerous arms and legs. The latter were at the edges of its under surface, while the former sprouted in a cluster from the center of its back. Its mouth was a ragged, toothless orifice beneath its eyes, surrounded by tufts of thick hair

whose icy sheen suggested that the flesh from which it projected was far different in function and chemical constitution from anything remotely resembling it that could belong to Earth.

Gregory Crois shuddered. There, beyond the transparent wall, was a Jovian demon which, though it resembled certain Terrestrial creatures in physical appearance, still must belong to a different life-order entirely. Whatever fluid flowed in its tissues could not even have water as its base, here in the withering cold of Jupiter. Ammonia gas, liquefied by the great pressure of an atmosphere thousands of miles deep, perhaps served as water in the flesh of this weird devil.

Greg was conscious of the dramatic import of this moment. Two cultures, represented by the Jovian and himself, were meeting for the first time in history. A gap of interplanetary distance had been bridged. Yet that gap was nothing compared to the immeasurable gulf made of a thousand differences of environment, tradition, and need. He felt more forcibly than ever before the immensity of those differences. And so, now, his only feeling for this monster of Jupiter was cold horror and suspicion.

Yet he was gripped by a sudden need to do something—anything—to steady himself. And so he began to whistle in short and long bursts to indicate the dots and dashes of their simple code language.

"You are a Jovian," he spelled, just as he had often done back on Earth, when his only contact with these weird folk was through the medium of his cosmic ray generator and detector. "I am a Terrestrial. Terrestrial—Earth. Jovian—Jupiter. Jovian said—Terrestrial help Jovian. How?"

PAST experience must have enabled the being beyond the frostless spot in the transparent wall to understand what was wanted without special difficulty. A re-

ply, however, considering the utter crudity of the only available means of communication, was hard indeed to accomplish. Nevertheless, as in the past, the Jovian made an attempt.

Dimly, through the wall, Greg heard buzzing vocalizations of code: "Terrestrial help Jovian. Jupiter moon—Jovian as Terrestrial—"

There was a pause. Gregory Cross might have gotten something out of these words in time. But his conclusions could have been only the vaguest of guesses, at best.

Then the gray-white devil seemed to have an inspiration.

"Terrestrial look Terrestrial!" he buzzed rapidly. "Terrestrial look Terrestrial!"

Greg's puzzlement over what was meant was only momentary. He looked down at himself, as he judged he had been commanded to do. During the first second of his scrutiny, he saw nothing unusual—but this was only because the flickering, uncertain light had tricked him a little. Then he saw the truth. His own arms and hands were gray-white, like ice and silver dust! This shade matched almost exactly the shade of the Jovian's own flesh! Even Greg's clothing had been transformed, the fabric of it changed to complex compounds belonging to a different order than its original synthetic-cellulose composition!

Part of Gregory Cross, the emotional part, was stunned. Yet his reasoning powers, for a few seconds, seemed to reach the keenness of sheer wizardry.

He saw part of the mystery, all at once, and almost clearly. How long had he been in Jupiter? A long time, evidently, for the minute observations which must have been a necessary preliminary to his transformation could scarcely have been made in a hurry. All the while that he had been in a state of suspended animation, since his arrival on Jupiter, these grotesque beings had

been studying the structure of his body, and the nature of his metabolism!

At last, here in this spherical chamber, frigid fluid had enveloped him, and from those grids suspended from the roof had come the energy for a stupendous vital change. When the fluid had receded he was still an Earthman in form—but the chemistry of his body, of his very life itself, had been altered, conforming to the vital chemistry of Jupiter!

No wonder the frost of congealed water was almost hot to his touch now! No wonder he felt comfortably warm in the vast cold that must pervade this compartment! At temperatures and pressures normal on Earth, he knew that he would evaporate swiftly into gas!

And now Gregory Cross made a new discovery—one that in all the excitement had escaped him before. He could hold his breath indefinitely. In fact, there was no involuntary impulse to breathe at all. He still possessed his lungs, but they no longer had any purpose except to enable him to make vocal sounds. His Jovian flesh needed hydrogen, not oxygen. Its energy came from a different sort of combustion. Perhaps that needed hydrogen diffused directly through his skin, his strangely altered flesh directly absorbing the swiftly diffusing hydrogen molecules. A feeling of untiring strength suffused him.

III.

NO TIME was given Cross for further speculation. Out of his daze he heard the distant buzz of the monster, spelling a code message: "Come! Jupiter moon."

A section of the globular compartment's wall folded outward. Greg tried to stand erect to meet the scrambling host of Jovians that found entrance through the opening. The demons clutched at him and pulled him roughly, whether in malice or haste he could not

know. No weird nerve compulsion was used now, only the power of brute numbers. The leader of the band, who had communicated with Greg, was near, recognizable by the fact that he was larger than his fellows, and was marked with peculiar reddish dots over his eyes.

Half dragged, half carried by dozens of thin, encircling arms, Gregory Cross presently found himself outside the transformation compartment. He was being borne along a cylindrical tunnel whose walls were transparent and frostless. Beyond them was Jupiter.

Confronted thus by the vivid reality of the giant planet's eternal, raging holocaust, Greg almost forgot his present position. He could see little through that blinding maelstrom, it was true; but from that little, one could still construct a mental picture that was more complete.

Wind. Lightning. Rain. Rain of liquefied ammonia, it must be. Greg could not smell its acrid pungence; but this, he decided, was natural. The sensitivity of his olfactory nerves had been changed, along with his flesh. On Earth, the water vapor in the air is almost odorless, too, as a result of human conditioning to its constant presence.

The rain thumped against the clear roof of the tunnel with the maddening roar of an avalanche. It was reddish, sticky rain, filled, no doubt, with the powdered ejecta of volcanoes. Not hot volcanoes such as existed on Earth, for Jupiter must be cold almost to the core. This vast world was composed largely of gases. The great cloud from which it had been formed, torn from the Sun by the passage of another star, had contracted slowly because of its low density.

Cold, however, does not deny the possibility of violent physical and chemical changes. On Jupiter there was still heat enough to produce tremendous explosive forces. Differences of high pressure in the vast atmosphere still could create winds that hurtled along at speeds

of hundreds, even thousands of miles an hour. And deep in this planet's solid core there was still warmth enough to change liquid ammonia to gas, creating pressure that could move masses of rock bigger than the Earth. Thus Jupiter must still have belching volcanoes, erupting hot molten lava and steam, but cold, speeding vapors, and the smuck of silicious dust.

OUT THERE beyond the curving, transparent walls of the tunnel, Gregory Cross thought that he could occasionally glimpse hills and rugged, rusty crags through the blur of the eternal storm. There was no illumination out there save that provided by the blinding flares of lightning. Through the thousands of miles of atmosphere above, no trace of the distant Sun's rays could ever penetrate.

The realization of being buried down here, beneath all those countless tons of ammonia and methane, created not as they were on Earth, as the result of the decay of organic material, but by the simpler processes incident to titanic pressure, brought Gregory Cross a fresh wave of panic that was half nostalgia.

In the wild blur of the storm he glimpsed flying, tattered shreds, and wondered whether they were just refuse borne on by the hurricane, or living things, adjusted to this hell, like the Jovians themselves.

Like a bit of flotsam, he was carried on by the hurrying, buzzing multitude of gray-white horrors. Sometimes his feet touched the floor, and he managed to walk for a few steps. Rough, horny bodies scraped against him. Occasionally, during the long minutes of passage through the tunnel, he thought of escape. But he knew that such an idea was useless, for there was nowhere that he might go. There was nothing now for him to do but let things happen.

The passage debouched at last into a chamber, whose colossal expanse must

have been many miles in extent. Partly, at least, it must have been imbedded in the ground. Its roof was a maze of gigantic girders, that seemed capable of combating even the gravity of Jupiter for all time. Far off in the distant, murky shadows, Greg saw dull glimmers that looked like flames of intense heat, shielded to protect Jove's cold-born folk from the killing warmth. Yes, they needed heat to fabricate metal. And they knew how to create it. For everywhere on this ghastly world, in spite of the low temperature, power surged madly, waiting only to be harnessed.

The floor of the chamber was dotted with machines of various kinds, motionless now amid a host of Jovians, who seemed to wait patiently for orders.

Wonderingly, Greg Cross looked at the three immense, disc-shaped things of metal that rested in a broad, sunken area. Their height was only a few hundred feet, but their diameters were easily a mile or more.

Into each, through narrow entrances, Jovians were swarming in a steady stream. Mingled with them were occasional articulated contrivances—robots.

Greg, his mind blurred and bewildered, allowed himself to be jostled on, until he, too, was aboard one of the gigantic vehicles. Up inclines, and along passages alight with a soft phosphorescent glow he was carried, until he found himself in a spheroidal chamber of about the same dimensions as the one in which he had first awakened. Its sides were of metal, and it had no windows. But at its center was a crystal globe, and near the globe were metal cords, supported in a divided arrangement by a hooplike contrivance. Each cord disappeared into a hole in the curved wall.

NO ATTEMPT was made to fasten the Earthman. But neither did he attempt to misuse his freedom. Temporarily a lethargic spell, perhaps related to the compulsion which had once

gripped his nerves, had melted his will. He slumped down wearily beside the crystal globe.

All but one of the Jovians had departed. This individual was a leader, marked with red dots over its eyes. That it was the same leader that Greg had first seen, there was little doubt, for always, since he had been hustled from the transformation compartment, the creature had kept close to him.

This individual squatted before the crystal globe. Sucker-tipped fingers pulled a cord. Suddenly, within the globe, there was light—a picture of the chamber in which the three colossal discs rested. The place was deserted now; the horde of Jovians that had been gathered in it doubtless were all within the discs.

Another cord was pulled, and the picture in the globe seemed to sink downward. The great craft was rising. Now it pressed against the roof of the chamber. There was a soft vibration of crescendoing energy, then a tearing, pinging noise, as the vessel tore through the mighty girders of the roof, as easily as a punch press might drive a hole through cardboard. For a long time after that nothing was visible in the vision globe but a dark fog flared with lightning. Greg knew that the craft was shooting up through the atmosphere of Jupiter.

The vision globe cleared at last. Mirrored in it were the stars of space, the scattered forms of Jupiter's satellites, and a vast sea of boiling clouds—Jupiter itself at close quarters. Some of those clouds were white and clean. Others were tinted with red or gray or blue, doubtless by the presence of volcanic dust of those various shades.

Everywhere was a frozen, awesome silence. Now the two other ships emerged from the clouds and glided in the Sun. Jupiter's bulk receded. One of the moons loomed ahead. It was Ganymede, largest of them all, almost

as big as Mars and marked in a similar manner.

There was only a gentle, soundless vibration. Greg could almost feel, in that soft throb, the battle of the mechanical colossus that bore him, with the mighty gravity of Jupiter.

What was going to happen? Greg felt a new interest in the things around him.

"To moon?" he questioned in whistled code.

"To moon," came the Jovian's buzzing answer.

Gregory Cross would have made other inquiries, had he known how it might be done.

IV.

IT WAS hours later that the ships settled toward the deserts of Ganymede. The Earthman looked at the tumbled, dusty dunes, sad and lifeless. Somewhere here, he supposed, he would die. Just how or when this would happen, he, of course, did not know. Yet his interest in the fascinating mysteries that were unfolding before him remained at high pitch.

What was that in the gorge which now lay below? A city? Slender, ruined towers of white stone. Odd, polygonal courtyards and plazas, with blue shadows stretching across them! It was a city—but one which bore the stamp of ancientness and utter desertion.

Presently, guided by its control cords, the disc landed at the lip of the gorge, close to the metropolis.

Only for a minute was there delay before other developments came. From several exits in the ship's flanks swarms of Jovians were pouring. But there was something queer about them! At first Greg thought it might be only a trick of the bright sunshine, or some optical aberration of the vision globe. Then he decided that neither of these guesses was correct. The flesh of these

creatures, scrambling madly and jubilantly from the vessel, really no longer was gray-white in shade! It was pinkish instead, almost like human flesh! Something had happened to those Jovians—something radical and strange and bizarre—else how could they venture forth unprotected, here where there was considerable solar warmth, and where the pressure was so low?

Gregory Cross gave a hoarse cry of surprise.

Of its own volition the leader beside him began to buzz a message: "Jovians as Terrestrians," it spelled.

It was not difficult now for Greg to guess what was meant. The life-chemistry of these creatures from Jupiter had been changed, so that it now corresponded with that of Earthmen! These beings had submitted themselves to a process which was the reverse of that to which Greg had been put.

Their motives in bringing him across space, from Earth, seemed clear now in part at least. They had wished to study his flesh, that they might know every phase of the life-principle that animated it. For they had wanted to migrate to Ganymede, in whose warmer and far thinner air living things suited to Jovian conditions could not survive for a minute without artificial protection. Greg realized that it was from his body that they had learned how to change themselves. For long months he must have been on Jupiter, lying inert in a state of suspended animation, while they made their intricate tests. During that time, perhaps, they had built the disc ships, fitting each with the apparatus necessary for the transformation, as soon as they had learned enough to build such apparatus.

Yes, part of the purpose of his bizarre interplanetary adventure, was plain now to Gregory Cross. But how did this ruined city here on Ganymede fit into

the picture? Who, in some bygone age, had masoned the stones of its towers and walls?

GREG whistled out a code message. "Jovians as Terrestrians. Yes," he spelled. "Moon—Ganymede. Jovians—Jupiter. Ganymede—Ganymedeans. Ganymedeans. Ganymedeans. Ganymedeans."

While he whistled the dots and dashes, Greg pointed to the metropolis pictured in the periscopic view revealed by the gision globe.

The suckerlike grasping organs of the hideous leader trembled as with intensity of desire to probe out the meaning which this Earth creature was trying to convey.

"Ganymedeans—yes," it buzzed at last. "Terrestrians—Earth. Jovians—Jupiter. Ganymedeans—Ganymede." And then: "Jovians—Ganymedeans!"

The leader's rasping voice seemed loud with excitement, as it made this simple statement, identifying the peoples of two worlds as the same.

But the leader did not end its message here, but continued to spell words into which, by what must have been a momentary touch of genius, it managed to inject real, discoverable meaning: "Ganymedeans as Ganymedeans—years—years—years—Sun hot. Good—yes! Years—years—years—Sun cold. Good—no! Ganymedeans—Sun hot! Ganymede cold. Jupiter—cold—cold—cold. Ganymedeans—cold—cold—cold—no! Ganymedeans as Jovians. Jovians—cold—cold—cold—yes! Ganymedeans as Jovians—cold—cold—cold—yes! Ganymedeans as Jovians to Jupiter—years—years—years. Good—yes. Good—no! Large gravity. Large storm. Ganymedeans as Ganymedeans—many. Ganymedeans as Jovians—many—no! Sun cold—Sun hot! Ganymedeans to Ganymede—no! Science—no! Terres-

trian to Jupiter—science—yes! Gany-medans as Ganymedeans to Ganymede—yes!”

Quint, intricate phrases full of obscure significance. Yet Gregory Cross, trained to the probing of secrets, understood. Ganymede was the original home of the Jovians! That had been in incalculable ages past, when the Sun had blazed in its hot prime. But it had lost its head, and Ganymede had become too cold for its people. Then, doubtless by studying Jovian life, they had learned to change themselves. Transformed, they had lived precariously on Jupiter for ages, their numbers slowly dwindling. When the Sun had warmed again, heated by the influx of the meteoric matter from space, they had wanted to return to their home world. But somewhere, during their long Jovian tribulation, they had lost the science which would have enabled them to change their life-principle back to its native form. Greg knew that the study of his flesh had turned the trick. The native life of Ganymede and the native life of Earth clearly belonged to the same order—breathing oxygen, needing water, instead of liquid ammonia, to flow in its tissues.

“Lord!” Cross gasped. “I see it all now!”

An odd wave of elation came over him, born of the knowledge that he had been the pivot of a great achievement. He thought of Earth and its people, suffering under the rays of a swollen Sun, and for a moment his elation gave him fresh hope.

“Terrestrial help Jovians,” he spelled. And then, insistently: “Jovians help Terrestrians!”

THERE WAS a long pause, while the triple, frosty orbs of the leader studied him carefully. Did this devil understand what the needs of the Terrestrians were? Probably. Yet, even with its vast learning, would it know

how to fill those needs? Conquering withering waves of heat streaming down upon an entire planet much nearer to the Sun than Ganymede, was too fast a problem. Did this alien horror feel any gratitude toward him? And if it did, was that gratitude great enough to prompt it to attempt a fulfillment of the gigantic favor he had asked?

Greg felt his hope melting in a sea of doubt.

Then the leader spelled his rasping reply. “Jovians help Terrestrians—no—yes—no—yes—no—yes.”

Gregory Cross wasn't sure that he understood this communication, but he took it to mean that the leader was expressing uncertainty of some kind—doubt, perhaps, of his and his people's ability to be of assistance to the Terrestrians.

Anyway, here in this strange, spherical control compartment, with fantastic magic all around, and with a living intelligence cast in fearful form scrutinizing him with unfathomable, frosty eyes, it was easy for a man to believe in—nothing at all! Gratitude? Greg was sure now that he had been foolish even to think of gratitude, on the part of this Jovian, even as a possibility. It is biological law that life in its various forms is largely inimical and competitive. One kind of life may use another kind to suit its purposes, but sympathy between the two is an exception rather than the rule.

Greg thought for a moment that he was going to crack—that he was going to scream insanely with the torturing anguish of utter homesick loneliness. Then he realized his self-imposed responsibility. Earth. Mankind facing extinction. Earth—Ganymede. Earth had had a moon of the same character as Jupiter's many moons. That moon might serve a purpose!

Thus, in an entirely unexpected flash, Gregory Cross conceived an idea. He was on his own, wasn't he? Yes, it

was best for a man to be on his own. At least he could trust himself. Here was a great ship, powered with energy inconceivable. There were its controls. Greg had watched the Jovian leader work those controls. It had seemed very simple.

But as yet he had no thought of attempting to put his idea into practice. It seemed too wild, and too full of uncertainties. Or perhaps he was still under the spell of some mild form of neurotic compulsion, originating, in some way from the mind of the Jovian leader. The latter's body was adorned with a few, odd, metallic devices which Greg hadn't noticed before. Maybe in one of those devices there was an apparatus that served to transmit the compulsion to his nerves—

Now the leader clutched Greg's arm with a cold tactile appendage. Puzzled, the Earthman allowed himself to be led from the control compartment. The latter's transparent door closed behind them. Now they were moving down a phosphorescent passage. There were no longer many Jovians about. Most of them had been transformed, and had left the ship.

V.

PRESENTLY Greg and his weird escort reached the transparent valve of a great spherical compartment. It was not difficult to guess the nature of this compartment, for, except for its gigantic size, it was identical to the globular chamber where Greg's Jovian awakening had occurred. Within it were the same kind of grids, and the same fluid wetness. It was a place of transformation.

"Jovian as Ganymedeon," the leader buzzed. "Terrestrial as Terrestrial."

Gregory Cross looked at his frosty, gray-white hands, and longed with all his might to be "Terrestrial as Terrestrial" once more, instead of the strange outcast he was. But if he were trans-

formed now, his last chance of acting on the idea he had thought of would be gone. In the hideous cold of super-chilled methane gas which pervaded the control room of this ship, he knew that no oxygen-breathing creature with water as its vital fluid could survive for more than a few seconds. Greg knew that he'd have to stay as he was, or discard his scheme.

He acted on impulse, for there was no time for further thought. The Jovian leader was busy now with the lock of the transformation compartment. If it had existed at all, the compulsion was momentarily in abeyance now. Under other circumstances the seeming carelessness of his weird guard might have struck Greg as being odd. But in this instant of beckoning action his mind had room for only a few essential ideas.

He wheeled about lithely, and darted into a dark, narrow tunnel. The feeble gravity of Ganymede lent wings to his feet as he bounded along through blurry gloom. The tunnel proved to be part of a veritable maze. It had many branches leading to hundreds of various supply compartments. Exerting an effort to keep his bearings, Greg followed one of these branches, and continued on, deep into the dark, silent labyrinth. At last he climbed up into an inky cavity, packed with cylinders of light-weight metal, filled, apparently, with some semi-liquid substance, for they gurgled faintly when he scrambled over them.

"Stupid!" he muttered, addressing himself. "Stupid fool! They'll find you sure!"

But minutes passed, piling up into hours, and still there were no signs of pursuit. Nor was it difficult to guess why. This mile-wide ship was so huge that to search all of it was no mean task. And even then places like his present refuge would be easy to overlook.

Now and then Greg could hear distant sounds which told him that there

was still activity on the vessel. At last weariness overtook him, and he slept. He awoke to feel the grip of a neurotic compulsion clutching at his body, commanding him to climb out of his hiding place. But he gritted his teeth and resisted. Presently there were sounds of movement in near-by chambers, and the slithering scrape of something moving away from him. The compulsion waned and vanished.

AFTER A TIME the tension of fear left him, and he slept again. On awakening, he felt hungry. What sort of food did his strange, alien flesh require? He didn't know. Nevertheless, exploration and a bit of experiment might give him the answer. The first things that came to hand for investigation were the stacked cylinders under him. He took one and battered it against the wall. A clear syrupy substance oozed out, and he touched a droplet of it to his lips. It had an acid taste which did not displease him. He tried a little more of the stuff, and then waited. There were no bad effects, so he consumed half a cylinder of the mysterious chemical.

The silence was heavy, eloquent of desertion. Refreshed and curious, Greg decided to look around a little. In a room not far away he found a large, square window. Beyond it the Gany-medean city sprawled, beautiful and fantastic under the rays of a rising Sun. Once more its plazas and courtyards were teeming with activity, after the passage of ages. Across the gorge that sheltered it, a tremendous column of steamy vapor was rising from a spot of incandescence on the dry sand. Around that spot, many of the creatures who had made the exodus from Jupiter were gathered. Pointing toward the area of fire were scores of massive, sharp-pointed electrodes, arranged in a circle.

What was the meaning of this ac-

tivity? Greg could only guess. The rising vapor looked like real steam. Perhaps transmutation of elements was taking place there in that furiously active pool of atomic incandescence—transmutation by which the atoms of sand were being torn apart and built up again to form molecules of water vapor and oxygen, to conquer the dryness of Gany-medea, and to replenish its depleted atmosphere.

Greg wondered vaguely why these weird folk hadn't long ago found a way to study the life of Earth, change themselves to suit Gany-medean conditions, and return from Jupiter to their native world. They had evidently possessed some knowledge of space travel for ages. But then he saw that there might be many reasons why they had failed to do this. Going to Jupiter from Gany-medea, considering the relative gravities of these two worlds, is a comparatively simple task. Going to Gany-medea from Jupiter is a far different story. It takes a mighty and well-directed force indeed to fight successfully the all-mastering attraction of the Titan of worlds. Perhaps, during those earlier days of Gany-medea's glory, her people had been able to reach Jupiter and return, on a small, and doubtless very dangerous, scale. But it was easily possible that only recently the Jovian colonists had gained sufficient mastery of atomic power to send a spacecraft to Earth and to escape from the world their ancestors had chosen.

Gregory Cross could waste no more minutes in impractical speculations. If he was going to act, he must do so now, while he had a chance.

HE SEARCHED supply rooms until he found a heavy metal bar. Then, with the tingles of fear rippling over his body, he proceeded to retrace his way through the maze of passages.

Without incident he reached the place before the entrance of the transforma-

tion compartment where he had escaped from the custody of the Jovian leader. Or perhaps he should think of the creature as a Ganymedeian leader now.

Cautiously, Greg proceeded on toward the vessel's spherical control room. It was well that he was careful, for before the door of that room a robot crouched, on guard. Greg's heart was in his throat, but taking advantage of an angle in the wall, he continued his cautious advance.

And then, like an avalanche of fury, he leaped upon the unsuspecting mechanism. The massive bar he carried arced in a diaphanous blur. There was a sharp, thudding crash of crumpling metal, in the cold, compressed atmosphere of methane. The bar rose again, smashed down, not once, but a score of times. Little splinters of crystal scattered across the floor, glinting jewellike in the phosphorescent illumination.

Now the assassin of this soulless mechanical thing darted back the way he had come. He found a ponderous, sliding door, niched in the wall, its purpose evidently being to seal the passage. Perhaps a safeguard against possible mishaps in space. It took a minute for Greg to locate the levers that worked the huge valve, but he did so at last. There were two sets of levers, so that the portal might be moved from either side. Greg smashed the set on the side away from the control room thoroughly with his bar. Then, under his manipulation of the other set, the portal slid quietly into place across the tunnel.

In all the other tunnels near by, there were similar doors. Greg doctored their external levers, and closed them all. At least, his intended activities wouldn't be interfered with right away.

The transparent door of the control room was locked in some manner. How, Greg could not discover, so he attacked it with the bar. This barrier was not of metal as were the other doors, but of some glassy material almost as tough.

Even its much less massive construction did not yield until Greg had pounded and pried at it for an hour or more. Now he crept through the breach he had made.

The vision globe in the control room was still active. In it the city could be seen, taking on an aspect of new life, the Sun gilding its fantastic spires and ramparts.

But Greg's gaze did not halt here. Instead, it wandered to cable controls of the ship, the ends of the cables supported around the rim of a hooplike frame. Which one of those cords had the Ganymedeian leader pulled to cause the vessel to rise? The third in the upper right quadrant of the circular support? Greg wasn't quite sure, but there was only one way to discover.

VI.

THIS, then, was the moment for action to begin. Greg's hand reached out and clutched the looped end of the cable. There was a prayer in his heart as he tugged gently. In his mind there were tense, maddening memories of Earth—pictures of gray, sunblasted plains, of blackened ruins, and of bleached bones imbedded in the desiccated stuff that had once been rich humus soil. They were human bones, yet they never could be as pathetic and appealing as the few million people who still survived in underground retreats and vacuum-shielded habitations. Gregory Cross had a little cousin who was five or six now. He lived with his father in the ruins of Chicago. That is, he did if he hadn't starved, or perished in one of the fierce storms that came nightly.

The memory of the child's big, questioning, haunted eyes ached in Greg's thoughts as he waited for some sign of response to his tugging of the cable.

Suddenly the disc ship gave a soft, swaying lurch. The surface of Gany-

mede revealed in the vision globe was dropping swiftly beneath.

Gregory Cross accepted this fact without elation, for the shock of success had rendered him emotionally numb. Still, his reasoning powers seemed to have achieved a crystal clarity and coolness.

Because ignorant tampering might result in a crash while the ship was still so close to the Jovian moon, he waited until the mighty thing that had responded to his command had attained the freedom of space before he did anything further.

The craft was curving toward Jupiter, doubtless drawn in that direction by the gravity. Otherwise, it was moving at a little less than a right angle to the position of the Sun.

Both of these circumstances required prompt correcting. And so Gregory Cross began to pull cables, one after another, gently, pausing each time to note the effect of his act. Thus he discovered that for each cable there was a mate, which, when pulled, neutralized the former's effect. Thus there was a cable for starting the ship's propulsive mechanism, and for speeding up energy release by merely increasing the pull. And there was a corresponding cable to decrease energy development, or to shut it off entirely, drawing the first cable to "off" position. Steering of the ship was accomplished by four cables, set at equally spaced points on the circumference of the supporting hoop. If you wanted the ship to turn right, you tugged the cable on the right. If you wanted the ship to turn left, you pulled the opposed mate cable on the left. In a similar manner, the directions "up" and "down," taken in relation to the level on which the vision globe stood, were controlled by the opposed cables at the top and bottom of the hooplike frame.

Pleased with his discovery, Greg proceeded to direct the flight of the vessel toward the Sun. In the glare of the

solar orb Earth could not be seen at all with the naked eye. But this did not matter—yet.

HIS LUCK seemed remarkably good. Yet there was still plenty to worry about. He looked into the vision globe for signs of pursuit. But no angry bulks were rising from the dwindling form of Ganymede. He listened, and he thought he heard distant, grating noises. Doubtless there still were Jovians—Ganymedeans—now—somewhere on the vessel. Would they try to get to him? Greg didn't know. If their bodies had been transformed from a liquid ammonia basis to a water basis, they couldn't live here in this part of the ship. Then, too, there were those mighty doors that could not be opened in a normal manner by any one beyond them.

Greg was startled and scared when he saw a small torpedo-shaped craft pictured in the vision globe. It was near the great disc ship he was guiding. At first he couldn't imagine how it had come so close without being noticed, and then he guessed the truth. It had been launched from the great disc itself! Aboard it doubtless were Ganymedeans who had been in the ship when it had started its runaway flight. Would they attempt some offensive move? No, they were hurtling swiftly away—returning to Ganymede. Doubtless they thought it futile to try to halt the colossal disc with their puny craft. To them, the former was now only a vast, onrushing mass of metal, derelict and dangerous.

"Better and better," Greg muttered to himself.

Yet still there was a deep conviction in his mind that his good fortune could not last. There were so many factors, in the great riddle with which he was involved, that he knew nothing about. And he was depending so much on luck and guesswork.

He was aware, too, that if the wild scheme that he had in mind for bettering conditions on Earth were carried out, he would surely perish. For one thing, from the viewpoint of the alien vitality which now animated his body, Earth was, and had always been, a place of death.

Yet he pulled the throttle cable to full. The ship was accelerating at an enormous rate, he knew. How fast would it go at the highest velocity it would attain? He knew of no way to answer this question now. He could only guess and hope.

The disc was better than a mile across. The Moon—Earth's satellite—was 2,160 miles in diameter. A great difference! Still—speed could do a lot to make up for lack of size. Then, too, the vessel evidently had enormous stores of power locked in it somewhere. What if that power were released suddenly, all at once? Of course he could not be sure that such a release of energy would take place—but he could be optimistic, knowing that he was doing his best.

He ceased to wonder and to question for the time being, and devoted his attention to mathematical calculations which he scratched on the metal wall of the control room with the diamond set in the black onyx of his signet ring. That ring had come through all his bizarre adventures, unchanged and unscathed, except for a slight tarnish.

Meanwhile, the disc ship tore on and on, the dwindling Jovian system behind giving evidence of its already vast velocity. It was moving almost at right angles to the plane of its flattened shape now, with what was intended to be its top facing the direction of its Sunward flight, so its acceleration provided a substitute for gravity, what acted from a natural, "downward" position.

FINISHING his tentative computations, Gregory Cross proceeded to examine the vision globe more closely. En-

circling it in various directions were rows of fine, graduated marks, like the graduated marks on the edge of a meter stick or ruler. Greg guessed that these minute lines were for the purpose of directing the ship's course more accurately, and for taking trigonometric measurements of its position with relation to other bodies in space. Some of these marks were longer than others, and one was longer than any, being tipped with a little triangle, like an arrow point. Greg soon discovered that when he looked through the clear, crystalline substance at the center of the triangle, he was looking directly along the line of the ship's course. Beyond, pictured in the globe itself, was the blazing blob of the Sun, and the surrounding blackness of space. The triangle, then, might be used as a sort of sight.

Greg squinted into it and pulled control cables, adjusting the disc's course more accurately toward a spot to the right of the solar orb, where he could now see the dim, hazy speck which marked the position of Earth and its satellite. Though his knowledge of the time-factors involved had been largely conjecture, his calculations had at least enabled him to predict crudely the position of Earth in its orbit, enabling him to locate it with a fair degree of accuracy.

As Greg had noticed vaguely before, the vision globe was periscopeic; that is, it provided a means to look in all directions, depending on the angle from which you peered into it. If from the right, you saw what was on the left of the ship; if from the left, you saw what was on the right. "Straight ahead" was viewed from its rearward side, and so on. But Greg was not interested in this trifling phenomenon now.

WEARY, and concluding at last that his search for evidence of danger was useless, he procured a cylinder of liquid food preparation from his former hiding

ply, and returned to the control chamber. Having eaten, he went to sleep.

On awakening, hours later, he found the view in the vision globe changed considerably. The Sun was huge now; Earth was a bright star, and the Moon was a lesser star beside it. At speeds of a thousand or more miles per second, even interplanetary distances are swiftly shortened.

Greg made other calculations, taking into account the movements of the Earth and the Moon. Once more he adjusted the control cables of the ship.

"It won't be long," he muttered. "When this ship reaches the vicinity of Earth, it will be doing about ten thousand a second. That's thirty-six million miles an hour! I hope what you're trying to do doesn't just make you a fool, Greg Cross. I hope you really succeed in helping those poor devils back home. Otherwise your fade-out will be—plain suicide."

VII

HE didn't notice the stealthy approach of the robot-shape that had dropped from the open end of something that was like a ventilation duct, set high in the wall of the passage. Behind him, the robot's beetlelike body reared up like a man, towering over him. Four metal arms encircling his torso with a grip that was literally one of steel.

Realization of what was happening maddened him. Through this semi-intelligent henchman of theirs, the Gany-means had at last found a way to reach him. Waves across space—commanding waves—and the mechanical brain of the robot was able to fill in the details of action. Doubtless the Gany-means might have mastered Cross directly, by means of their neuronics compulsion, acting through receivers which must exist on the ship. But this way was simpler. Perhaps they had waited

until now, only to play cat and mouse with him.

Gregory Cross fought the robot with an insane fury that was backed up by all the horror a human being could feel for these demons that had come out of the cold holocaust of Jupiter, by the inhuman strength of his altered body, and by all the anger that a defeated and vital purpose could give him.

He achieved nothing. The stolid, unchanging grip of the automaton did not relax. Greg's exertions only served to deplete his energies, and to bring him utter exhaustion. He felt himself carried along by his metal conqueror. Dazed to the point of unconsciousness, he thought he heard watery sounds around him. His mind blurred away slowly—

The next he knew, the robot was carrying him swiftly along the same corridor, but toward the control room instead of away from it. He couldn't guess what had taken place during the considerable time that he must have been inert. But there was something odd about the various details of the situation in which he found himself. The sounds made by the robot's feet on the metal floor of the passage seemed less loud than they had before, as though they were transmitted by a medium of lower density. The illuminating phosphorescence had a different quality, and Greg felt cold.

But sight of the control room entrance ended his vague speculations. Fixed purpose took possession of him. He struggled with a new weakness in the robot's clutches. The intensity of his single objective allowed him to feel no wonder when the mechanism released him. He scrambled to the battered door, and through the opening that had been blasted in it.

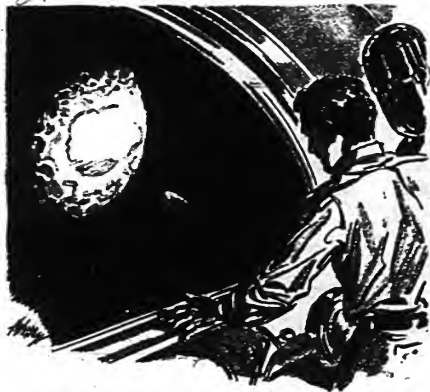
In the control room, on hands and knees, he peered into the vision globe. Now he pulled control cables, sighting

through the center of the triangular mark. The ship was perfectly aligned at last on the little yellow arc that was the Moon, ahead. The Earth, beside it, was a small, foggy crescent.

Greg stepped back. He was aware that only minutes remained before the

"Damn you!" he screamed as the robot bore him off, down the corridor.

THEN, slowly, understanding began to dawn on him. He saw his arms, his hands. They didn't look frosty and ghoulish any more—they were the shade



An instant later, Moon and hurtling disc-ship were blotted out in an intolerable flare of light—

crash. His job was finished. Unless the robot interfered—

He turned defensively toward the thing, his body at a crouch. But a slender metal arm shot toward him like an adder's tongue, wrapping itself around his middle. He was yanked from his feet and dragged through the ragged rent in the control room door.

of normal, bronzed, Earthly flesh! He'd been retransformed! The robot must have carried him to the transformation chamber while he was unconscious, and had put him through the reverse of the process to which he had been subjected on Jupiter! The air around him wasn't compressed methane now, but was evidently of much the same composition

and density as that of Earth, for he was breathing it in a natural manner! The methane must have been pumped out of these passages and chambers, and replaced by comparatively warm oxygen and nitrogen from supply tanks! The robot had been the agent of this change, of course. Yet back of the robot's acts certainly there lay the purposes of keener, kinder minds than its mechanical brain might possess. Greg knew then that those minds were certainly Ganymedeans, sending their orders across the void doubtless by means of the artificial cosmic rays which the queer folk of the Jovian system used for long-distance communication—

"How—how can it be?" he muttered. "It's not—sense! Those devils never would—" He left the phrase unfinished, for it did not keep pace with his speeding thoughts. "Unless," he finished savagely, "they've got some new dirty trick up their sleeves!"

But this was no time to think. Too much was happening. The automaton was now bearing Greg down a side tunnel. The tunnel ended in a cylindrical compartment which housed a small, tapered space boat. Greg soon found himself inside the craft with his metal escort. There was a thrusting jolt as the little vehicle was hurled from the now-opened end of the cylindrical compartment by a launching device, and projected out into empty space beyond the outer shell of the great disc ship.

Then came the dazing pressure of terrific deceleration, as the robot plied control cables to reduce the speed imparted to the small vessel by its mother craft.

Again Gregory Cross' brain was dipped in the blackness of oblivion. When he came out of it, the great disc, directly visible through an observation window at the front of the cabin, instead of through the medium of a vision globe, had dwindled to a gleaming me-

tallic dot, far ahead. Directly in its path was the crescent Moon.

Such was the picture which his eyes captured in an infinitesimal instant. But movement in that picture was far too swift for human eyes to follow.

In a split second the collision of Moon and disc ship occurred. There was no sound to it in the vacuum of the void—just a sensation of a stupendous puff of light that brought aching blindness. That light was a by-product of a speed of ten thousand miles per second converted suddenly into the energy of heat, and combining with the greater heat and terrific blasting power of the atomic fuel in the disc's tanks. The fuel that had been set off by the inconceivable impact to which it had been subjected.

WHEN Greg's vision had cleared again, he saw, where the Moon had been, only a vast pall of dust and rock fragments, shining faintly red with heat. Slowly, along what had been the disc ship's line of flight, it was lengthening out, while it expanded laterally. Its farther end, pulled by Terrestrial gravitation, was curving around the Earth, whose foggy bulk hung unobtrusively to the right. Across its deserts, visible here and there through the fog, a friendly shadow was appearing—a shadow cast by the lunar wreckage.

Greg knew that that cloud of rock and dust which had once been the Moon would gradually disperse itself around the Earth, forming at last a screen of debris that would shield Terra from that awful torrent of solar heat and light, dimming it to a point where it would no longer be dangerous or harmful. This meant new comfort once more, new surface cities, new vegetation. New life and freedom to the peoples of Earth! And because one moon had broken up to form myriads.

Gregory Cross could hardly believe what had taken place. He turned to-

ward the robot beside him, and watched the thing dumbly. It was manipulating control cables. The space boat was veering away from the lunar pail, to escape being riddled by passing through it. Once again, to a lesser degree than before, came that fierce pressure of deceleration. But in spite of decreasing velocity, Earth swept swiftly past, and began to dwindle astern.

Greg felt a flash of panic. What was the robot trying to do? But then Greg was reassured. The automaton was only doing what it must; it would take hours to bring the spaceship to a halt, for, before its launching, it had been aboard the great disc ship, and had naturally received the same tremendous acceleration. Not until the little craft had lost its terrific speed, could it begin to retrace its way.

But still Gregory Cross was bewildered. "The Ganymedeans are friends," he said dazedly. "They must be friends because they did all they did. Even when I ran away with their ship. But how can such demons be friendly to Earthmen? Different kinds of life generally aren't—"

Then Greg found what must have been the answer. "Let's reverse the situation," he muttered to himself, trying to straighten matters out. "Supposing some creature from another planet

were brought to Earth. Supposing it benefited mankind as much as I—unwittingly—benefited the Ganymedeans. Wouldn't there be at least a good chance that Terrestrians would be kindly disposed toward that creature and all its kind; even if the price was a costly spaceship?

"The Ganymedeans must have guessed what I was going to do—about the Moon. Nothing difficult there—just parallel reasoning, that's all. Maybe sometime they'll come to Earth—the heat won't stop them, now that they're changed. Maybe they'll come to conquer, but not for a long time anyway, for there are only a few of them, and they have plenty of room on Ganymede. And between now and then, lots of things can happen. Terrestrians are clever, too."

Many hours later, having checked its speed, and having looped back in space, the little ship landed on Earth, close to Greg's laboratory. The robot that had guided it went inert, perhaps having served its purpose for all time.

But from a box attached to the wall of the cabin came tinkling sounds spelling out dots and dashes that had their origin far across the interplanetary wastes.

"Terrestrial help Jovians as Ganymedeans," they spelled naively. "Ganymedeans help Terrestrians."

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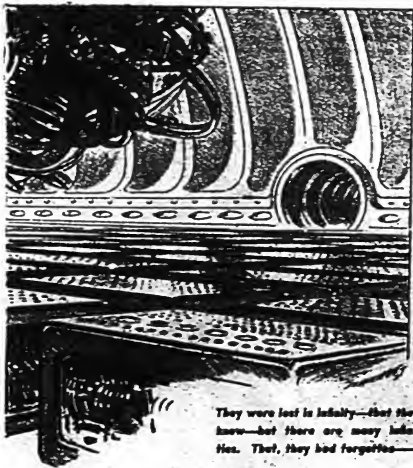
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*Again the vast
mechanism moved,
searching among a mil-
lion, million recorded stars
for that one they sought—*

Flight of the Dawn Star

by Robert Moore Williams



They were lost in infancy—that they know—but there are many infancies. That, they had forgotten—

THE port lock opened with a slight hiss, and Technician Jack Graham stepped out. He sucked in great mouthfuls of the wine-rich air of this new planet, and it flooded through his being like a draught of an ageless life-giving elixir, which somehow seemed to heal and soothe the fear that had been—and still was—a black shadow weighing heavily on his mind.

There was a sun of sorts overhead—an ancient, yellowish sun, bathing in its beneficent glow the long rolling sweep of the garden land. Quietly flowing streams

wound placidly through green meadows and among green trees. His eyes followed the horizon round and he gaped at what he saw. Turning, he called within the ship.

"Ruddy Sarl, navigator and amateur astronomer, answered: "What is it? I'm coming as fast as I can."

Ruddy Sarl stood in the lock, with one hand shading his eyes against the glow of the sun while he followed his comrade's pointing hand.

He whistled softly, and there was surprise and awe and a lack of understand-

ing in what he did not say, but mostly there was awe. Awe tells the story where words leave off, and magnificent, and supreme, and mighty, and colossal, and all the other adjectives would not have described the city half as well as the words Ruddy Sarl did not use. He looked. His eyes brought him evidence of stupendous height, of story piled on story that reached up to the clouds themselves, of graceful lines and sweeping curves, an edifice wrought by the patient toil of uncounted generations laboring to create in material things a city adequate to their vast dreaming. And his eyes also told him that the dream had failed—for the city had crumbled and was still crumbling to the ground. His eyes stopped seeing at that point and his mind took up the task, wondering what had happened to the men who had built that city, what could have happened to thwart the ambitions of a race capable of such construction? War? Pestilence? Famine? Flood? Back on Earth—with a shock and a wrench he realized it was the Earth he would never see again—those four factors took inevitable toll of the ambitious construction of men. War? Pestilence? Famine? Flood? Barbaric hobgoblins of a civilization in the state of barbarism!

But here, on this unknown planet, some mighty race had risen above barbarism. The evidence was irrefutable. The race that built that city could not have been involved in war or threatened by pestilence or flood. What, then, had happened?

"Perhaps——" Graham showed where his thoughts were running. "Perhaps there are people here somewhere who can help us——"

Reluctantly Sarl forced himself to think of the present.

"Yes—yes, there may be—still. There once was, no doubt of it. But—well, no telling how many years have passed since the inhabitants left that city. Ten thousand—hundred thousand—a million.

The place seems built to last forever, but forever is so long——" There was an odd touch of pathos in his voice. He was thinking of the wasted materials and labor. And most of all, of the wasted dreams, so adequately expressed in the gray ruin towering toward the yellow sun.

"You are certain," Graham anxiously inquired, "that you don't know where we are?"

Sarl shrugged eloquent shoulders. "Last night, as we were dropping down to this planet, you saw the stars. Did you recognize any of them, or any of the constellations?"

GRAHAM shivered. When the warp had released them they had hurried to the ports, and all around them, stretching away for lightyear after lightyear, infinitely distant, had been the stars, pin points of exploding light against the black fabric of dead space. Stars—and as far as the eye could reach—more stars, until all conception of their number was lost, and in that vast expanse of space no constellation that they even remotely recognized.

Home—home—— The green hills of Earth so far away that even the stout atomic engines of the *Dawn Star* could not push them there. Graham swallowed, then tried to grin. "Well, we can make the best of it—— What do you say we go look?"

"All we can do," Sarl answered, stepping lithely to the ground. They had not taken a dozen steps before Graham slapped at his hip.

"Fools!" he growled. "To go running around a strange planet without a gun of any kind. We've learned better than that."

He turned on his heel and strode rapidly back to the ship. When he returned he was buckling a positron gun to his body. He handed a second weapon to Sarl, who silently gazed at it.

"Put it on," Graham snapped.

"All right—only—well, this world looks so confounded peaceful that even the thought of a gun is somehow revolting."

"Yes, but no matter how things look, I know it's peaceful after I've turned this thing loose on it."

Staring at the city, Sari buckled on the gun. The city was so huge and the gun so small—yes, he could blast an awful hole in the city as the stream of released positrons combined with the electrons of the building material—or any other material—blasting the electrons into nothingness and releasing a flood of gamma rays. A very efficient little weapon. Men of the Solar System found a use for them. When Mars raided Jupiter or Jupiter raided Venus or either of them raided Earth, the positron gun was a handy thing to have, for it blasted men and raiding ships out of space. Occasionally, when its own confined force field failed, it blasted the user. But that was only a regrettable accident.

Perhaps it would be needed. Sari hoped not. The men who could build such a city could build weapons, too. Only—faint the way the city looked, weapons had never been used on it.

Walking over fields soft with grass, where they could not hear the sound of their own footsteps, under trees and across streams, they approached the city. Their eyes fastened on it, yet the occasional hurried glances over the land revealed what each was thinking. What had become of the descendants of the race that built those sky-high towers? There was no sign of them. Had they vanished into the vast void of forgotten things? Had they sought a new home elsewhere? Had the natural resources of their planet failed—little by little—until there was not enough left to support the inhabitants? Who could tell? The city had seen them go, but it was

steeped in silence. Somehow it did not seem to be a sorrowing silence. More it seemed an empty nest, from which the nestlings, having no longer a use for it, had flown—

They walked on, and the city climbed high above them, rising tier on tier into the sky, yearning toward the vast above.

"No one here," Sari said thoughtfully. "In this quiet air such a city would last for eternity, forever and forever—and then a day." His voice trailed off.

"It does not seem possible," Graham protested, "that a race intelligent enough, strong enough, to build this city would have perished. But it has." And he thought of Nineveh and Karnak and Thebes and the ruins of Baalbek, festering under Earth's sun off yonder somewhere in the vast void of space.

AS IF in refutation, the air was suddenly vibrant with the note of a voice. Then another voice took up the sound and another and another, and the voices laughed together, happily, and the air vibrated with a pleasing sound. They could not see its source, but with one accord they stepped to the protection of a huge tree and hid behind it, seeking the origin of the laughter suddenly filling the air.

"Some one is here," said Graham.

"Look," Sari breathed. "No—not at the city. At that meadow there."

There was a flash of bronze in the meadow, and laughing and dancing from the shadow of the trees came a figure. Naked, it was, and seemingly it needed no clothing. Following the first figure were others, all repeating the steps of a rhythmic dance.

"Children," Sari whispered. "No—youths."

"Playing——" Jack Graham said to himself.

His voice was heavy with wonder. In the shadow of the greatest city he had

ever seen, the youth of a race was playing. While the creation of their ancestors corroded into ruin around them, they played silly dancing games, waving their arms and tossing their bodies in the sunlight, carelessly indifferent of the labor of long generations of workers who had toiled and dreamed for them. Or was this true? Perhaps the race of builders had perished and these youths belonged to another emerging race, a group beginning the slow climb upward from savagery to civilization? Graham did not understand. If they were an emerging race, how could they play when that mighty city was there, brooding over lost secrets, challenging the imagination of any fertile mind to solve its mysteries—

Sarl stepped out from behind the tree and waved his arms at the dancers and Graham swore at him and lifted his positron gun.

"Put it down," said Sarl, glancing at the weapon.

"How do we know they're friendly?" Graham argued. "I'm not taking any chances."

The dancers stopped. They seemed to freeze in their positions while they stared at the two strange figures who had so suddenly appeared. Then they were running, dancing over the meadow toward them, and Graham was gripping his gun, his finger on the trigger. He had never known a form of life that was not at war with all other forms of life. It was the law of evolution—a grim, gray law grown hoary through forgotten ages of survival.

Then the dancers were on them and the air was filled with the chatter of voices that were somehow friendly and not at all curious. Graham eased the pressure on the trigger and waited. With the exception of minor differences, they seemed like seventeen-year-old youths from Earth. Their bodies were slender and utterly naked. Their limbs

were well-formed, symmetrical and graceful. Their eyes were wide and smiling. They carried themselves with a sureness, with a certainty that was full of meaning—

Sarl stood there smiling, a little ahead of Graham, and the five youths danced to within ten feet of him, and then stopped, suddenly. Their eyes went wide and the smile on their faces died out. Curiosity replaced the smile and then a mild wonder, and mixed with the wonder was an awe in which there showed a trace of fear.

"We thought——"

Graham dropped his gun. His own brain talked to him!

"We thought you were Ulvan and Dar—but you aren't. Who are you?"

"Strangers from a far land," Sarl answered, unperturbed, and Graham, flushing, picked up his gun. He had been on Mars often enough to know the possibilities of telepathy, but he had not expected it here. The Martians were an old race, an ancient, learned race. But these people were young. Obviously they belonged to a race on its way up, whereas telepathy was something that only a very old race could use. Controlled telepathy took brain power, and brain power meant untold years of evolution. Or it worked that way in the Solar System. Perhaps— But they were asking questions.

"Strangers? There are no strangers here."

SARL, navigator and amateur astronomer, tried to explain. Only he knew how hard a task he had. Even if this race did have the ability to use telepathy, how could he explain a space warp to them? Yet he knew he had to explain it. They wanted to know. He had the feeling that if the explanation was not adequate—but it was only a feeling. Graham kept the gun ready, and listened.

"We shoved off from Mercurry, the

planet nearest our sun, and just for the hell of it, mostly, but also because I wanted to check the bending of light rays under the Sun's mass, we poked our ship in toward the Sun. You know, we wanted to see how close we could get without being burned. I had an idea—but no matter. We went in as close as we dared, to the point where the gravity of the mighty mass had us in such a tight grip that our engines could scarcely pull us out—when something happened. I think a sunspot exploded under us. Anyhow—there was a flash of blinding light and then everything was black. The ship creaked and groaned and popped and the engines had no effect. Everything was black for hours, and then a sort of dim grayness filtered through the ports. Again there was a click, and we were floating in space—with a new universe around us—

They were listening very attentively to Sari, Graham thought—just as though they understood it all, when even Sari didn't understand it. He was just guessing, but it sounded like a good guess, as good as any. And here they were, which somehow seemed to prove that Sari was right. Graham choked up inside. They would never see the rolling plains of Earth again—never. But he kept his finger on the gun.

The five bronze youths conferred. Graham got the idea that they were sorry for Sari and him, that they would help if they could. Only they couldn't. There wasn't any way to help. It was impossible. Time wasn't long enough.

The nearest youth smiled at Sari. "I am Nard," he said. "Your story has interested us. What happened is really very simple. You were twisted out of your space and into another space, and then back into your own space, but you didn't come out where you went in. You looped through hyper-space for an untold distance. It is unfortunate—we are sorry."

Graham blinked. They understood.

And they answered Sari. Not in words, but in pure ideas. The words they used to each other were an obscure but hauntingly familiar chatter—meaningless—But they knew about space. They knew. It seemed impossible—Graham glanced at the city climbing up toward the sky and back at the five slender striplings. He could not understand. There was a nebulous thought in his mind—He took his finger off the trigger.

Nard smiled at him. He nodded toward the city. "You are wondering about that? Our forebears built it, in the long ago—" He used a term that indicated time, but it carried no meaning to Graham. Too vast. But he felt a strange nostalgic touch of envy.

Sari was asking questions. Sari wanted to know. Where were their elders? What had happened to make them desert their cities? Were there other people like them on this planet? Were there girls? Did people die here? Foolish questions. But Nard answered them smilingly.

From the answers there emerged a meaning that Graham could not quite comprehend, and Sari, too, knitted his brows in perplexity.

THERE WERE no elders, Nard said. They were the elders, these striplings, these bronzed and careless youths. They never grew any older than that. It was puzzling. They grew older in years but not in physical development. Here, the decrepitude of old age did not exist. They had merely arrested physical change. Nard talked of molecules and atoms and waves and vibrations. He dug deep into the structure of matter, and Sari nodded for a time and then stopped nodding as the explanation went beyond him. And Graham did not follow that far, but he knew that Nard had told him why they never grew old.

Yes, there were girls here, and people died, too—though only through accident; and there were many others like them.

Sarl suggested to Nard and his companions that they return with them to visit their ship. They went. The *Dawn Star* rested softly on the deep grass. Nard went through it, with his fellows, and Sarl explained how it operated, and they were politely interested, but they were not astonished at all.

"There are ships somewhat like this one over there in the city," Nard explained. "Their principle of operation is different, but the result is the same: they fly."

"Don't you ever use them?" Graham asked.

"Oh, no. Our ancestors flew everywhere and learned everything, and if we wanted to know anything we would go into the cities and look in the libraries and the answer would be there. But we rarely need to know anything," he added naively.

"Not need to know?" Sarl gasped.

"Why should we? We have everything we need, and nothing"—he paused and groped for the meaning he wanted—"troubles us."

"But," Sarl exploded, "how can you stand it? I would go mad with nothing to do."

"We play and we think. That is enough."

It was enough, Graham and Sarl saw in the days that followed. It sounded stupid and silly, but it wasn't. There wasn't any objective left for the descendants of this lost race to seek. So they played, and they encouraged Jack Graham and Ruddy Sarl to play with them. But the Earthlings could not master the intricacies of the games. They were clumsy and they stumbled. And the positron gun which Graham wore constantly got in his way. And when the inhabitants were tired of playing and withdrew to think, the Earthlings could

not follow them at all. For this was done one by one. The bronzed youths or equally bronzed girls simply slipped away from their comrades to stretch out on the grass, staring fixedly at nothing. They did not work. Why should they? A pleasant-tasting, strangely satisfying fruit grew on the trees and this was all they ate. Sarl examined the trees and the fruit and muttered to himself and Nard explained that there was a perfect balance between food supply and inhabitants. Back in the long past all that had been planned. Graham muttered that everything seemed to have been planned. He did not like it.

Nard had difficulty in understanding what they wanted to know, when Graham asked about government. Government? He didn't know what that was—the idea of one man having power over other men. Finally he understood.

"There is no government. Each one does as he pleases. Our fathers struggled a very long time that we might be ungoverned. It was one of their dreams."

"But don't you have disputes?"

"Disputes? No. We are civilized. We are intelligent."

It struck Graham that this was the perfect answer. In a truly intelligent civilization there would be no cause for disputes. But—

DAYS PASSED. Graham and Sarl tried to understand and to participate, but it was hard. Both of them looking at the city, the ancient city sleeping peacefully in the yellow sun—Nard had said that there were libraries there—libraries where all facts were gathered.

A little by a little Graham and Sarl realized that nostalgia was growing on them. Here was heaven, but they had little use for it. Here was peace and intelligence, but more and more often they looked at the city—

They were Earthlings, and life on

Earth was a rushing, fighting, jostling, scurrying affair—they were not ready for peace. Peace and understanding came through long centuries, through thousands and hundreds of thousands of years. They were barbarians, Graham and Sari, young barbarians out of their era. Off yonder, somewhere in space, was a newer solar system, where the last problem had not been solved, where the last spaceship had not made its final flight and settled home forever. And yet this strange planet on which they landed was somehow a dream world, a haven dimly sought—

They looked more often at the city.

Nard came to them. "You want to go home," he stated quietly.

"Lord, yes!" Graham almost sobbed, and Sari nodded slowly.

"We had hoped you would prefer to stay here. In time, we believe we could teach you to love it. But here we do as we please, and it is your will to return home. We will go to the city."

"It is not possible to return home," said Sari flatly. "We are not only lost, but the distance is much too vast—light-years—"

Nard continued smiling. "The distance is no difficulty. We can project you into hyper-space and hurl you outward at a speed infinitely greater than that of light. But there may be some difficulty in knowing where to send you. Space is so large—"

"You tell me—" Graham whispered, but Sari spoke flatly.

"It is not possible to return home. How can you select our sun from the infinite number of suns lost in space? Our sun may be out of vision entirely."

"Come," Nard answered. "We shall see."

They went to the city. It towered above them, dreaming in the vault of heaven. They were ants—they were less than ants crawling in the shadow of the Matterhorn—

AST—J

Nard led them to an opening, and into a tunnel. They turned and twisted; lights flashed on to light their way and turned off after they had passed.

"My people," said Nard—and there was pride in the way he said it—"planned all this."

They came to a vast room. Lights winked on around them. Down this room were aisle after aisle of tablelike boards covered with myriads of tiny buttons.

"Here we will see if we can discover where to send you."

Sari faced him. "Do you realize what you are saying? You are telling us that the solution of the Problem of Multiple Bodies is here. It is not possible—"

GRAHAM knew that back on Earth the astronomers and mathematicians were still struggling to discover the equations that would completely represent the behavior of three bodies. The mathematicians knew there was an answer—because the problem was solved in nature—but they had not been able to find the equations. They were seeking them desperately. They would answer the most important question of the Solar System—how to predict the behavior of more than two bodies.

"My ancestors solved the problem of three bodies and of more than three bodies. Then—in order to facilitate the practical solution of that problem—they built a machine to do the work for them. They were great on building machines," he added.

Sari took a deep breath. "Those ancestors of yours must have been a great people."

"Perhaps they were. It is so difficult to know, from this distance. At any rate, they had ambitions—"

"Now will you give me some pertinent facts about your solar system. I doubt if they included all the facts about your system—if they mapped it at all—"

but they probably knew about your sun, and fitted it into their machine. If it is a large sun, they did—otherwise they would not have obtained correct answers to their problems."

"What do you mean by pertinent facts?"

"Weight, for one. Rate of radiation, for another. Those things are part of the problem, and are especially important if the time involved is very great, since the weight and the radiation rate shrink. Time—time——" Nard paused, perplexed. "I had almost forgotten," he apologized. "This machine has not been used in a very long time." He pointed to the shadowy framework in the room.

Nard moved a lever. The great framework above them started moving. Graham and Sarl stared at it.

"You see," Nard explained as the framework shifted, "this is a miniature representation of the known universe. But when we came in, it had not been used for some thousands of years, and the time factor had to be brought up to date. The data you have on your sun would not be correct for several thousand years ago, and the machine would never locate your sun for us.

"The people who built this machine took an arbitrary point in space for their starting point. They drew imaginary lines dividing space into four quadrants. Then they placed all the stars where they belonged at that moment, with machinery to move them. The operator can then follow the stars through all space and all time, even to the end of time."

"How can that be?" Sarl asked.

Nard explained. Vibration and interwoven vibration, energy and negative energy levels—— Graham watched the framework turn above them. He did not hear the words. Nard was groping, anyhow, trying to explain in primitive ideas something that only a mathemati-

cian could grasp. Graham watched the framework as it turned.

It stopped. "It has reached the present," said Nard.

He went down the tables, punching buttons, feeding into the machine the facts Sarl had given him. He pressed a master switch. The lights went out——

Graham heard his own voice crying in the darkness. Involuntarily he jerked the positron gun from his belt.

ON A BLACK screen in front of them appeared a tiny sun, a white-hot flaming sun. For a second it looked like—— and during that second wild hope was in Graham's heart, and then he saw the three tiny points of lights moving around it, and he knew it was not Sol——

"No," he heard Sarl whisper in the darkness. "That is not our system."

"We will examine the series above and below it," Nard answered, manipulating the controls.

There was another sun framed in the black velvet screen that somehow looked like space——also might be space, for the men who could build this machine might do that, too. But it was not Sol——there were no planets. Sarl whispered in the darkness and Nard whispered in reply and there was another sun, but there were no planets around it either. And Graham knew how it felt to have hope die out. Earth——smiling Mother Earth——I will not return to you——ever——for ever——and forever.

There were more whispers and more flaming points of light, and Graham could tell that Nard was perplexed and in doubt and he wondered why he did not screen all the suns in space, for that way they would surely stumble on the right one. But he knew they had only one lifetime in which to do it, and generation after generation of men had labored building this machine and putting the suns there. To show them all would take——he did not know how many years. There were so many stars.

And Nard sighed and the lights came on again, and Graham knew that Nard had given up. Why should he spend a lifetime trying to help two strangers return home?

But Nard was talking again to Sarl, asking him questions—asking him more about the space warp and how it acted. There was an odd perplexed light in Nard's eyes. And then there was a shining light in his eyes and the lights in the room were gone—

Graham could feel the shifting of the framework over him as time moved again, as the factor governing time

bled in the darkness for Sarl and pounded him on the back and Sarl was hugging him and he was hugging Sarl. He was a barbarian and he belonged back on that barbaric Earth, back in that barbaric age. He had never known how much he really belonged there until this moment.

And Nard had said that he could send them back, that the return would be easy, that only the knowing where to return them had been difficult—

Home—home again! His shout echoed and reechoed through the mighty vault above.



shifted the framework that moved the suns, and he knew that minutes had passed. He stirred protestingly and Nard whispered to him to be patient. The minutes moved into hours and still the time factor shifted. And it was suddenly very lonely in the vast room.

There was a sun on the screen and Sarl was counting joyously—"Six—seven—eight! It's the Solar System! It's there."

Graham heard himself shouting. Out toward the edge of the screen were—unmistakable sign—the rings of Saturn! The one thing that nature had never duplicated. And third out from the Sun was—Earth!

Home— Graham gulped and fum-

THE LIGHT came on, and there was Nard—but he wasn't smiling, and his eyes weren't shining, either. His eyes were misty and Nard turned away as they watched.

Graham and Sarl knew that something was wrong.

They leaped to the side of the bronze youth, roughly turned him around, and Graham fumbled for his positron gun. Then they saw the drawn, pinched look on his face. They released him—

"Nard—you don't mean—you don't—you can't help us return? You said you could."

Nard lifted his shoulders—a gesture strangely Earthly—and he shook his head.

"I am sorry. I can't return you. You are already there."

"There?" Graham gabbled. "This city on Earth! You—this strange peaceful race on barbaric Earth? No!" His voice thundered.

"This is Earth. This is Earth—but more than a million years after you left it. I should have known you were Earth-sired. Your bodies—a dozen things should have told me. But you unintentionally misled me into thinking about distance in space instead of in time."

"But——" Graham tried to say, and he saw Sarl's face. Somehow Sarl understood.

"That warp," said Sarl slowly.

"—was a time warp and not a space warp. You went along with the Sun as it moved, and when you came through again, the stars had shifted until you couldn't recognize them. You thought you had been shifted in space. You had been, of course, but there are an infinite number of spaces, of possible spaces. You were warped into one where time had almost stopped. You took over the time-rate of the space where you were, and over a million years passed. When I couldn't locate your sun, I suspected the truth, and I set the controls on our sun and sent the time factor backward. There is no doubt——"

"Then we'll never—get home?" Graham's voice was a whisper.

Nard shook his head.

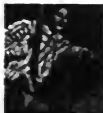
"No. I could send you through space, but not back through time. It is not possible."

Graham fingered his gun, doubtful, hesitant, frightened, as Nard led them out of the city. They were out of the tunnel. The city towered sky-high above them, and they looked up at it.

"Our descendants—not exactly ours—but the descendants of our race, built that," said Sarl, and pride grew strong in his voice, and Graham heard the note of pride and finally understood. "Somehow we skipped all of the work and arrived at the goal of our dreaming. I can see it now. Back on Earth, we dreamed of peace and quiet, a land without hunger and without cold—Eden—The Happy Isles—Paradise. Well, it is good to know—that the race won through to the realization of its dreams."

Sarl looked at Graham. Jack Graham had laid his gun on the ground, and one by one he was removing his garments, tossing them carelessly away, as though he would never need them again. And Nard looked, and Nard smiled. And Sarl started removing his clothes, too.

They walked over the green meadows toward the shade of the friendly trees——



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SCIENCE-FICTION

Astounding has changed its title. There's a reason, of course, and I think most of you can give that reason yourselves. *Stories* means nothing, explains nothing. And explanation and understanding are the things new readers need most. *Stories* carried no message that was intelligible; the new title explains to the unfamiliar something of what our material is.

There are thousands of people in this world who would enjoy *Astounding*. I know; people who never happen to start reading it, never get to know what it is. No average mind can either understand or enjoy science-fiction; it takes an amount of imagination beyond the average man. Too, it requires a type of mind that realizes it does not know all there is to know, and has some curiosity about that unknown. It is the mind which already has an unusual stock of knowledge that is willing to admit there is more to know. Curiously, the less a man knows, the less he is willing to admit that he does not know all that there's any sense in knowing.

We cannot appeal to those who "know all there's any sense in knowing", because we presuppose, in these stories, two things: that there is yet to be learned infinitely more than is now known, and that Man can learn it. But only those who are keenly interested in the future believe in that. The average man realizes that the world will not come to an end tomorrow, that progress will not end tomorrow. But he realizes that so vaguely that he feels no interest in it.

To enjoy science-fiction, we must more than vaguely know that; we must keenly appreciate it and be interested in tomorrow and tomorrow's tomorrow. Ask a man to answer this question automatically, without stopping to think: "Which is nearer, 1930 or 1940?" If the answer is made truly without calculation, most will say, "1930."

But some will not. Those who can, and are willing to think of the future, are the ones we can, and want to, appeal to with *Astounding*. Science is the gateway to that future; its predictions alone can give us some glimpse of time to come. Therefore, we are adding "science" to our title, for the man who is interested in science must be interested in the future, and appreciate that the old order not only does change, but must change.

By that change in title, we are trying to let others who would enjoy the magazine, if only they understood, become acquainted. I know that change will help, but even so, thousands who might be enjoying the magazine will not, for lack of training. That curiosity about the future is so seldom developed, even when it exists, because there are so few publications for its development. For more than the change in title, the aid of readers is needed. You can reach those who would enjoy the magazine, with a little training in the exercise of that dormant future-curiosity.

If a man's thought processes run: "I don't know anything about a rocket-ship. It won't work," he cannot like *Astounding Science-Fiction*. But if he thinks: "I don't know anything about rocket-ships. It doesn't seem that they could work," that man would, and should enjoy the future. Loan him a copy of the magazine!

The Editor.

The MASTER Shall Not Die!

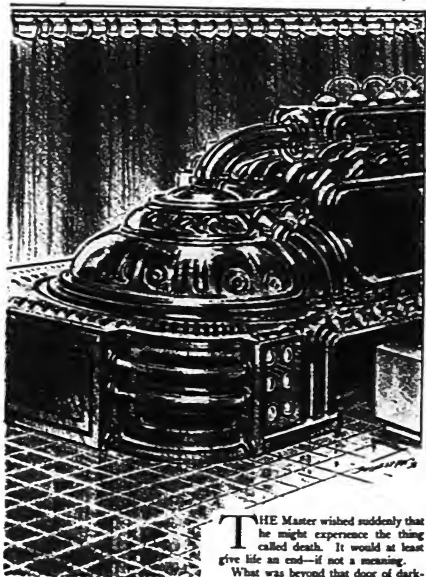


"He died a thousand years ago—but he is not dead." The Master swept the curtain aside.

Of the Man Who Dared Not Die—

by

R. DeWitt Miller



THE Master wished suddenly that he might experience the thing called death. It would at least give life an end—if not a meaning. What was beyond that door of dark-

ness toward which Time herded all other men? At the moment he did not much care. His interest was limited to a mild curiosity. His concern with death was merely a weariness with life.

He was not a stranger to that feeling. Often it had come to him during the lonely hours when he had struggled in this room, seeking to integrate the ever more complex science of the world. His was the ultimate loneliness of a bit of eternity marooned in a world fettered to time.

Out of the stream of memories rushing past the focal point of his mind faces smiled at him, hands reached out for him, voices spoke softly—friends, companions, associations—men and women he had worked with and loved.

"Come," they called faintly, "come with us. This is the way that men must go."

But he could not follow them. For the Master could taste any wine but old age and death. And there was no help for it! Unless— Out of his consciousness swirled again the idea which had become the center of his existence. *If I cannot die—then I must make all men deathless.*

In an effort to bring his mind back to the reality of the moment, he glanced at his hands. They were decidedly the hands of an aging man. Thirty years before they had been smooth, except for the supple modeling of powerful, accurate muscles. Now a complex pattern of wrinkles was beginning to crisscross the softening flesh.

Once more the cycle had run. It was time to turn back the physiological clock again. For the brain that integrated science must not be housed by an old body; if the Master grew old, he would die, and the thread going back almost ten centuries would be broken.

That thread must not break now. It was still too soon. If the Master died, the machine would win and man would lose.

He pressed a buzzer calling his chief assistant. While he waited, the Master strode to the window and stood looking at the city outside which hung up its giant complexity into the coming night.

Level after level of traffic lanes stretched below him. On his own level a giro landing was hard pressed to handle the evening crowd. Far across the city he could make out the tower of the central rocket station, its gigantic projector arm pointing squarely at the setting sun.

Yes, he thought, man had done well. He had reduced the machine to slavery. He had conquered his environment—except for the last long jump.

"You rang, Master."

"Yes, Hubbard. Is the donor here?"

"He is waiting outside."

"He has been told, of course, that it means giving up his life?" It always seemed strange to the Master that he must ask that same question every thirty years. It was hard sometimes to remember that all the men about him, all the assistants and technicians, changed every generation.

"Yes, Master. After the committee of physicians selected him, he was told exactly what was ahead. He is entirely willing to give his life."

The Master did not turn from the window. His face was immobile, the features highlighted by the last of the sunlight.

IT HAD COME again—the moment when he must face the man whose life would be traded for his youth. His mind went back over the long line of gallant young men who had died that the Master might be deathless. He thought of their strong, steady faces as they had offered their lives on the altar of man's inability to cope with the machine. It was not fair.

Hubbard sensed the Master's somber mood, and said softly, "You have done a great work. You have saved man."

The Master shook his head.

"No, Hubbard. I didn't do it. They did—all those men like the one waiting outside. They gave their lives for me."

"Not for you—for science."

"Then it's up to science to pay them back."

"But that cannot be done."

The Master did not answer. There was no advantage in telling Hubbard. It would only make trouble. After a long silence he returned to his desk. "Send the donor in," he said finally.

The young man who came into the room was a beautiful specimen of physical development. It seemed to the Master that each time the donor was stronger and finer.

"I am ready, Master," the man said quietly.

The Master shook his head.

"The operation will not be performed until to-morrow. I wish to talk to you first. I have always done so."

"As you wish, Master."

The young man stood with his head thrown back, his massive shoulders relaxed.

The Master wondered if the man would prefer to have it over at once. But there was no way to find out. For a thousand years the Master's orders had been final on all matters. That fact was ingrained into the people of the world. For centuries it had not been questioned. They accepted the Master as a necessary part of their lives—as necessary as water or air.

They were free to quarrel among themselves, so long as they did not use the weapons of science for destruction. They could change their forms of government. They could deal with all matters except those concerning science and the machine. That had been the decision of the great meeting a thousand years before.

The political governments were

guarded by the world-wide organization of scientists from any action which would permit the machine to destroy human happiness—instead of increasing it. A few times the political leaders had become arrogant. That arrogance had been short lived. Scientists knew how to make their decisions final. But that had been long ago. For centuries there had been peace and understanding among men.

Above the scientists was the Master. He was the focal point toward which all the branches of science led. Through him they were combined for a single purpose—the welfare of the human race. There had been little trouble. Scientists were thinkers; they understood the necessity of a single intelligence which could untangle their troubles by seeing all science instead of only one little corner. It was all a matter of perspective—the focal length of your mental lens.

II.

THE MASTER realized that his mind was going backward again, reviewing a past that no longer mattered. The way of science was forward—not back. He concentrated his attention on the man before him.

"What is your name?" he asked.

"Barrett Norgard."

"Your profession?"

"Bio-chemist."

A queer hopeful expression flicked across the face of the Master.

"Do you know anything about Dr. Martell's experiments?"

"Yes," Norgard said with sudden interest. "I studied with him for two years."

The Master did not follow the lead. Instead he looked steadily past Norgard at the tracework of neo-tubes lighting the city outside. Finally he said: "I know that the committee has informed you of the operation you face, of the

fact that your life must be exchanged for my youth. But they probably did not explain the events a thousand years ago which led to the creation of my position in the new scientific world. The facts of that great convention were once familiar to all scientists, but that was long ago. Men forget. At present they accept me without questioning or seeking to discover why I exist. They accept me as inevitable, as the snow and wind are inevitable. They forget that I—or rather, my position in the world—was created by men, for the use of men."

"I know the situation well enough to appreciate the part I have to play," Norgard said quietly. "That is all I wish to know."

"You have a right to know everything," the Master replied. "You have every right to be told the exact circumstances by the one man who was alive at the time it began. Therefore, I will explain it to you. It has been my custom to do so to all the donors."

He pulled his mind away from the plan which was taking vague outline, and concentrated on the story which he had told so many weary times.

"About the year 2500, men of science discovered that it was impossible for men in brief human lifetimes to cope with the machine. By that time the machine had become so complex that it had outstripped the knowledge which any single human brain could amass in one lifetime.

"Not only had each single machine become inconceivably complex, but each type of work involved the use of many types of apparatus. Each apparatus had its own set of technicians. It was a specialty requiring a lifetime of study to understand. But some single person must be able to coordinate all the different types of machines. Such a person would require complete knowledge in all the fields of science. Such knowledge could only be gained in many

ordinary lifetimes. The human mind was not limited—but the time to learn was.

"The result was that machines began to fail to perform their functions. But human beings had in the meantime become accustomed to a highly civilized form of life. Comforts had rapidly become necessities. Men could no longer go back to the older, cruder way of life. The scarcity of the more complex types of machinery and of men capable of operating them caused unrest and war. It had become a battle between man and the machine, with man on the losing end.

"The more advanced of the scientists saw what had occurred. They called a great meeting of the best thinkers of the race at Lucerne. Many methods of solving the problem were discussed, but it all came back to the same thing. The average man's lifetime was ten times too short. *It still is.*"

"Science will solve even that problem some day," Norgard said slowly.

"Some day. Always some day." The Master stared at his aging hands.

"YOU'RE a bio-chemist," he said suddenly. "Why do we grow old?"

"Stated simply," Norgard said, his eyes alight with sudden animation, "each organ of the human body poisons every other organ. Waste products are thrown into the blood stream. A certain amount are eliminated from the body—but there is always a small residue. In this way composition of the blood stream is slowly changed. At first this change merely inhibits the growth of the body and so causes maturity. But later the poisons in the blood stream check the replacement of worn-out tissue. The body begins to age. This change of the chemical composition of the blood is final and irreversible."

"Yes," the Master said slowly. "It was irreversible a thousand years ago.

That one, great problem science has not conquered. It has gone around it—but it has not conquered it. Science has been unable to increase the lifetime of all men, so it has made one man immortal and used the knowledge which a thousand years of constant study has placed in his brain to control and integrate the machine.

"At the great convention I spoke of a moment ago, it was decided to concentrate scientific research on an effort to discover a way to lengthen the average lifetime. I was then an old biologist. Working along the line of reasoning you just outlined, I began experimenting with methods of changing the chemical composition of old blood.

"Failing in this, I thought of simply exchanging the entire blood in an old person's body for that of a young person. Experiments with animals indicated that it would work. I brought my proposition before a committee of scientists. They agreed to the experiment. A young man offered his blood for the experiment. My blood was exchanged for his. The operation was successful. I became young. But—when my blood was placed in the body of the donor, he died.

"I demanded that the experiments be stopped. You couldn't turn that data loose. It would cause wholesale murder—for blood.

"Another great meeting of scientists was called. Every other method of rejuvenation had proved a failure. War, disaster, and death were stalking the Earth. There was no way back; there was no hope unless the machine could be brought under the control of at least one human brain.

"It was decided to create the Master. He would be supreme in all things pertaining to the machine. His blood would be renewed every thirty years. His brain could keep pace with the advance of science, his mind a living store-

house of knowledge. He would integrate the different fields of science. He would control all fields of research for the benefit of man.

"I was selected for the post. The order was issued to the governments of the world. There was some dissension. The scientists used the powers of destruction which they knew so well to make their order effective.

"A generation went by, another. Men began to take me for granted. Peace, plenty, and happiness came again to the world."

"But why were no more men permitted to stay young?" Norgard asked.

"As I just mentioned, the price was too high. The thing would get out of hand. The world would again be plunged into war—for young blood. One man, and one alone, could be deathless."

"But if your experiment was known to the world, why hasn't it been duplicated? No laws are strong enough to prevent men from seeking eternal youth."

"Your point," the Master agreed, "is well taken. In fact, it was brought up at once at the great convention. If the method were universally known, the world would be thrown into anarchy. But the method is not known."

"You mean that the technique is known only to a few scientists?"

"It is far more closely guarded than that. It is known to me alone. You see, I haven't been the only investigator who has attempted to accomplish rejuvenation by changing blood. Many other attempts have been made—many more will be made—and all have failed but mine."

"I know," Norgard said bitterly. "I found that out in my work. All of a person's blood cannot be drained from his body or he dies instantly. If the old blood is steadily replaced with new,

there is bound to be a certain amount of old blood in the final mixture. That causes death."

"Why?" the Master asked with a strange undertone of meaning in his voice. "Death does not follow a normal blood transfusion."

"In such a transfusion," Norgard replied, "there is always much more of the person's own blood than that of the donor. The great mass of original blood neutralizes the foreign constituents of the new blood and benefit results from the increase of total hemoglobin. But when there is only a small portion of original blood it acts exactly as would the wrong type of blood given in a transfusion. In other words, it is antagonistic to the new blood, causing it to clot and bringing on death."

"I see," the Master said softly, "that you have learned a great deal in your chosen field. I am glad of that. It is not my custom to discuss such matters with a donor. In this case I have had reasons for questioning you."

"I am happy, Master, that I have pleased you."

"There is one more point. You spoke a moment ago about a strange constituent or essence of blood. What is this thing which you mention so vaguely?"

NORGARD smiled slowly. "I wish I knew. Blood is a subtle thing. We have analyzed it in a thousand ways. We have gone down to the atoms which compose it. Always something has escaped us."

"I understand," the Master said softly. "I understand, because I, too, have hunted that elusive thing. But the difference is that I found it—or, rather, I found a way to get around it."

Norgard sprang forward.

"What is it? That is all we need to know."

The Master shook his head.

"That is the secret I spoke of. It is locked in my brain. Neither you nor any man can get it out." He looked steadily at Norgard for a moment. "It is that fact which created the Master. Men have tried in many ways to discover it. They have even thought of murder. But they have realized that death would only close my lips forever. Then the world would be without the Master. The situation would be worse than it was a thousand years ago. There would be no one to integrate the science. The machine would win."

"Master," Norgard said softly, "I was thinking no such thoughts."

The Master smiled. "You mistook me. I trust you. My mind had gone back to other men. A thousand years is a long time."

For a moment there was silence in the little room. The weight of those ten centuries seemed to be a tangible thing forever separating the Master from other men.

At last Norgard said, "Master, may I speak freely?"

"Of course. It is the least I can offer you."

The Master was thinking swiftly. Here at last was a man able to throw off the ingrained idea that the Master's merest statement was never to be questioned. Well, why not try his plan tonight? There could never be a better assistant than the man before him.

"Do you realize," Norgard began slowly, "that your discovery is the one thing necessary to complete our experiments? By not telling us, you are preventing a possible solution to the problem—a solution which would give eternal youth to every one."

"You forget, Norgard, one thing. My discovery makes possible the changing of old blood for new. It cannot change the old blood into young blood."

"But it is a long step. With that

beginning, our present scientists might do the rest."

"And it would fill the world with human vampires fighting for every young person's blood. I have judged men a long time. I know what temptations they can stand—and what temptations make them insane beasts. And the worst of all is the desire for renewed youth." He looked away. His words were suddenly bitter. "If a few of them knew what it is to be eternal in a world which death still rules, they might be more reasonable."

Norgard stood up. His powerful body shut out the lights of the city. His voice was still quiet. "Then I am ready."

"Remember that the decision of the committee is not final. The most physically fit of the young scientists of this city is always chosen as donor. Scientists have always been chosen, because they know best how to dedicate their lives not to themselves, but to the world. They could probably find another body as good as yours. But—if even the Master may speak frankly—the world will be poorer for losing your mind."

"I would prefer to be the donor myself. It would be hard, otherwise, to think of the one who must then take my place."

"As you wish. But think of one other thing. I will not explain the technique now—but for an hour my life and the life of civilization will be in your hands. Your courage had better fail now than then."

"I am ready, Master."

"You can expect nothing but death."

"I am ready."

The Master looked down at the desk. Yes, he thought, it was a rotten way to run a world. He spoke without looking up.

"Meet me at my private laboratory at ten to-night."

III.

FOR A LONG TIME after Norgard had gone, the Master did not look at the pile of reports and dispatches on his desk. When he did return to the most urgent of the matters referred to him, he worked with only half his mind.

Rocket transportation to Europe had been disrupted by a mysterious force field which pulled the ships out of their course. The Master called the North European atomic-cracking plant on the television set and asked for a schedule of production.

This revealed that an inventive technician had changed the generator hookup for reasons of local efficiency. This, in turn, had produced an energy by-product which interfered with the wave length on which the rockets operated. The Master ordered a return to the old hookup, until technicians which he dispatched could find a way to cut off the undesired wave length.

Plans for building a new station for extracting basic minerals from sea water were completed. The site of the station was an island in the Pacific. Something about the name of the island struck the Master as significant.

He checked through his memory, called for the history of world events for a period three centuries before, and discovered a volcanic eruption on the island in question. The volcano was now apparently extinct, but a check on cycles of volcanic activity in that region showed a suspicious three-hundred-year cycle. The Master put the matter aside for further investigation.

There was a strange outbreak of insanity among the people of Southern Asia. The psychologists were baffled. The Master weighed possibilities. Some mistake in eugenics thirty years ago? Something wrong with the synthetic food being produced in that section, the inclusion of some apparently harmless

chemical, that in combination with some other harmless factor, caused brain deterioration? Or possibly those super-high frequency waves from the new type radio power station in China? Some of the workers who had experimented with that new power had gone insane.

The Master called for information from several widely separated fields. To-morrow he'd try to untangle the thing.

Somehow, all the work of science seemed puny and insignificant compared with what he would attempt that night. Or should he attempt it?

He laid aside the rest of his work and gave his mind over to speculation.

PLEASING, shadowless radiance flooded the long, domed passageway which led to the Master's private laboratory. The Master looked at Norgard's face. It was expressionless.

They walked on down the passage. At the end was a massive door whose surface gleamed with the dull luster of mydonite, the metal which centuries before had replaced steel.

The Master led the way. He set the combination of the delicate lock on the mydonite door.

"No one enters my laboratory except myself and the donors," he said to Norgard.

As the last number of the combination slipped into place, the great door slid back. Automatically the shadowless light filled the large laboratory.

One entire wall of the room was lined with oblong, casket-shaped cabinets. The front of each was concealed by a curtain on which was printed a number.

"My explanation will be brief," the Master said, seating himself at a desk in the center of the room. "We covered most of the general points in the discussion this afternoon."

Norgard sat opposite the Master.

Even in the warm light his face was white and harsh. He reached jerkily into his pocket.

"May I smoke?"

"Of course. If there is any other little thing—some one you wish to see? There is much time. A few hours' delay will not matter."

Norgard smoked his cigarette slowly. At last his lips moved. The words were toneless, almost a ritual.

"I am ready, Master."

The Master shrugged.

"As we agreed this afternoon," he began, "the trouble has been the inability of science to drain all the blood from a person's body without causing death. In fact, science has given up that angle and concentrated on methods of performing a continuous transfusion.

"However, I did not neglect that possibility. I gave up my efforts to change the composition of old blood, and concentrated on a method of creating suspended animation during the period between the time that the last of the old blood was drained away and the first of the new substituted.

"A thousand years ago I discovered a method to accomplish this. It is that secret which prevents the world from duplicating my experiments."

"Lord," Norgard said, with a sudden caught breath, "we've been working from the wrong end all the time."

"Exactly—but also, fortunately. The day any scientist announces a method of making a complete transfusion of blood—civilization will end in a war for young blood."

The Master stepped to the end of the line of metal cabinets. He threw back the curtain. The glass-covered box was empty. Swiftly he attached two cables to electrodes which protruded from the box.

Going to an intricate hookup of gleaming condensers and tubes, he threw sev-

eral switches. Generators deep within the great building whined shrilly as they took the load.

Suddenly the interior of the empty cabinet began to glow with pale, lambent flames. Slowly the Master advanced the control of the central rheostat. In response, the individual flames within the casket coalesced into a single sheet of radiance. Swiftly the color changed from rose to purple, to violet, then gradually faded to a faint iridescent mist.

THE MASTER cut the power. The scream of the dynamos died to a faint steady pur—but the iridescent mist remained in the cabinet.

"That cabinet," the Master said softly, "is now charged with what I term *life insulation*. In a moment it will be your tomb of living death."

He looked sharply at Norgard, but the young man's face was still set like white stone. The Master returned to his explanatory tone.

"My original idea was that it is a fundamental mistake to consider the basis of life as chemical. It is electrical, or rather, radioactive."

"But what has that to do with suspended animation?"

"Everything. To suspend life you must not only suspend chemical activity, but its radioactivity as well. If the chemical factor is not suspended, decay occurs; if the radioactive is not suspended, the vital force, or what might crudely be called life-atom potential, goes back into the well from which it came. Life will never return to such an organism—the spark is gone."

He strode to the cabinet containing the glowing mist and tapped the glass cover.

"In here I have created a radioactive insulator which will prevent the life potentials from escaping from any organism. At the same time, chemical decay is

stopped. Anything bathed in that radioactive field is completely sterile."

"But will the field remain in that cabinet?"

The Master smiled slowly.

"Those are not ordinary mydonite boxes, although they appear to be. The walls are double. Within them is created an electro-magnetic charge which prevents the escape of the radioactive field.

"I do not intend to give you the technical details. It took ten ordinary lifetimes for me to perfect it. Originally, the field had to be constantly maintained."

He seated himself opposite Norgard. "Stated simply," he said, "I have trapped the human aura. Radium gives off a visible aura; the human body also gives off an aura, but it is visible only under certain rare conditions. That has been known for centuries. But the specialization of the branches of science prevented those two facts being connected. So no one saw the point that the human aura was only the emanations from the subtle radioactivity of the life force."

"But why," Norgard asked, "is it necessary to seal your radioactive field, when suspended animation is only necessary during the period of the transfusion?"

"Because," the Master said slowly, "I wanted to give the men who have offered their lives for science—a chance to get them back."

He stepped to the nearest cabinet and slid back the curtain. In the cabinet was the nude form of a powerful young man. About him swirled the same iridescent mist.

Norgard stepped back with a sudden cry.

"Is that the last donor?"

"Exactly. And there, in that tank beside him, is the blood from my body

which was exchanged for his."

"But why—why not let him die and have it over with?"

"As far as his consciousness is concerned, he is dead. He loses nothing. But—he gains the chance of returning to life, if science ever perfects a way to change the old blood in the cabinet to young."

"But science can never do that."

The Master's voice was hard, biting.

"It is not for you—or any man—to say what science cannot do."

IV.

NORGARD stood bewildered for a moment. The Master could see his mind struggling between disagreement and the old, ingrained idea of the human race that the Master's word was final. Slowly the young man's face became impassive again.

"I am ready, Master. How is the operation done?"

"Very simply. I step into an empty cabinet. You then create the life-insulating field I just described. The blood is pumped out of my body through hoses which pierce the cabinet wall.

"You will set the time clock on the machine for the period of one hour, and step into the cabinet next to mine. You will take with you the tank carrying my blood. After anesthetizing one arm, you will connect the tubes running to my body, to a vein under your elbow. Last of all, you will close your cabinet and throw the switch which will pump the blood from your body into mine, and at the same time create the field around you.

"When the hour is over, the time clock will open my cabinet, thereby breaking the radioactive field and returning me to life. As you see, this method permits every centimeter of blood in my body being changed.

"I will now give you detailed instruc-

tions covering each part of the procedure."

With minute care the Master went over each step. He did not explain the theoretical operation and construction of any of the machines. Those belonged in the realm of super-integrated science, which was known only to the Master.

Finally, they rehearsed the technique. When the Master decided that Norgard's quick mind understood each detail, he stopped and lit another cigarette.

He sat a long time quietly. The smoke drifted up into the clear, motionless air of the room. His mind was making a final review of the possibilities. If he was to make the experiment—it must be done now. If he stepped into the cabinet and gave Norgard the signal to begin the operation, it would be another thirty years before he could try again.

But he might discover final and definite proof of his theory during those thirty years. He shrugged aside possibility. It had always been the same—this hoping that the next time his proof would be perfect. A good many million people died during each of those thirty years. Each time he delayed, their hope of youth was shattered. It wasn't fair. It wasn't fair to them or to himself—the immortality—isolated Master. But it did no good to think about it. There was only one way to answer the question.

A wave of the old loneliness surged over him. If only he could give eternal youth to all men— There was no freedom for the human race until it conquered death.

He stood up. His face was steady with the calm strength that had ruled the scientific world ten centuries. His quiet voice seemed somehow too big for the room.

"Norgard, I told you this afternoon that you could expect nothing but death. You have accepted that statement with

a courage that is a credit to the scientists of the world. There was something else which I might have told you—but I had not quite decided on the matter. I have now.

"Since the beginning of this strange cycle which has made me immortal, I have had a dream. It was a dangerous dream. Therefore, I told no one. I worked in my laboratory. I failed. I failed again and again—how many times I do not know. Ten centuries of my memory are scattered with the ruins of such hopes. Almost a hundred years ago I achieved what was almost success.

"I waited. I hoped that my proof might be final. Last week I achieved what I believed practically conclusive proof. To-night my dream may come true. If it does, neither you nor any human being need ever grow old again."

FOR A LONG TIME Norgard did not move. When at last he spoke, his voice was fumbling and disconnected, like a man suddenly aroused from sleep.

"You've—solved it—you've made old blood young—"

The Master nodded.

"In a moment I will show you a rat whose blood I have treated and returned to its body. That rat should have died of old age. By every check it is now a young animal."

"Then I—I won't have to be sealed in a living death in one of those boxes?"

"No. If we succeed to-night, the tragedy of those boxes will pass from the Earth. And—thank Heaven—the office of the Master will pass with it." His words were suddenly rapid, passionate. "Do you know what it means to go on living when everything you value dies? To know that every human being to whom you become attached will wither and die, while you remain ageless?"

He turned abruptly and stood staring at the young man in the cabinet, bathed in the glowing haze.

AST—4

"But," muttered Norgard, "how was it done? What data have we overlooked?"

"None. You did as well as ordinary men could in brief lifetimes. But death cut you short. It stopped your researches just as they were beginning to bear a little fruit. You could at most be completely familiar with only a few of the countless divisions of science. Your thoughts never got out of their familiar circles, because you lacked the perspective of time. What, for instance, do you believe is the relationship between basal metabolism and radioactivity?"

"I don't see any," Norgard declared. "It's like trying to find a relationship between my cigarette and cosmic rays."

"And yet," the Master said dryly, "the relationship between cosmic rays and cigarettes cost thousands of lives in the year 3100."

"What do you mean?"

"In that year increased intensity of cosmic rays caused mutations in tobacco plants. One of the products of these mutations was a hybrid which, although it looked and smoked like ordinary tobacco, secreted a vegetable alkaloid which caused a great increase of death from certain types of heart disease. You never heard of it apparently. But that is only natural. It concerns horticultural and medical history, both of which are outside of your field of specialization."

"I see," Norgard said slowly. "I got only part of the picture."

"Exactly. The focal length of your mental lens is too short. The focal length of mine is a thousand years. From that distance the whole thing begins to fit together. It took data from all of science for me to discover that old blood does not need to be changed chemically—but recharged subatomically."

"But the chemical composition does change with age."

"Of course. But that is the effect, not the cause. Recharge the life atoms that are the basis of blood, and the chemical unbalance will readjust itself."

"You've done that?"

ences. Only a few of the hundreds of instruments could Norgard even name. He stood staring, bewildered.

"You see," the Master said slowly, "how hopeless it is for you—or any



The Master stood frozen for long seconds. The rat was dead—but more than that, a thousand years of effort and hope was dead.

"Yes," the Master replied. "But"—he opened a small door and beckoned Norgard to follow—"it took this to do it."

V.

THE ROOM was jammed with apparatus from a hundred different sci-

ordinary man—to understand. The result of a thousand years of science, in countless apparently unrelated fields, is in this room.

He stepped quickly among the crowded apparatus, and brought out a small covered cage. "And this," he said quietly, "is the proof that with suffi-

cient perspective, science can even conquer old age and natural death."

Carefully placing the cage on a table, he removed the cover. The pale glow of the indirect light softly illuminated the interior.

The purr of the dynamos far beneath them seemed suddenly loud. The room with its weird collection of apparatus was filled with a mocking presence. The long rows of tubes, gauges, transformers, and calculators leered at the two men. The great god of the machine was there laughing from among his hundreds of creations—

For in the little cage the rat lay bloated and motionless.

"It can't be—it can't be——"

The Master's voice was choked and broken. In that instant the poise of a thousand years slipped from him. In place of the Master, the supreme director of science, there was a tired old man facing the wreckage of the work of fifty lifetimes.

Norgard recovered first. He made an effort to shake off the feeling of hopelessness, but his words were hollow, "Maybe there's some mistake. Could it have died from some other cause? You know that it lived a week after the operation, and that it became young."

The Master's body drooped with aching weariness. His voice was under control again, but it was flat and toneless.

"No. They always died that way—that same bloated, congested appearance. Besides—it couldn't have died from any other cause. It had no physical defect. I examined it before the operation. Its diet has been regulated. Even the atmosphere in the cage is sterilized."

"But perhaps——"

The Master cut him short.

"There isn't any other possible answer. I recharged the life potential of

the blood, but it wasn't permanent. The change was only superficial."

"But if you are that close, surely you will soon succeed."

The Master did not answer. He led the way back into the other room. All the vitality seemed to have been sucked out of his body. At last he said: "I've thought that, too—perhaps a hundred times. Always it was almost. This time I was certain. I had done everything I could."

Slowly Norgard's face became set and expressionless. His big shoulders tensed. The fire of enthusiasm flickered out of his eyes. When he spoke, it was again as if he were reciting his part in some ritual.

"I am ready, Master."

The Master did not look up. He was not thinking of Norgard, nor of the operation. His mind was still concentrated on the rat which lay dead in the other room. How much longer could it go on? Another thirty years? Another century? Could he, after all, have been on the wrong track?

But that wasn't possible. There was already too much proof. No, there must have been some hitch somewhere, some miscalculation. After all, a week was quite a considerable part of a rat's lifetime. If only he could experiment on men——

SLOWLY a decision was taking form in his mind. There was one way to settle the matter—only one. Perhaps Norgard had been right about the rat dying from some other cause.

And suddenly the loneliness could no longer be controlled. The experiment did not matter, nothing mattered but the chance for escape from the isolation of deathlessness. Even if he died in bloated agony like the rat, it would be better than facing another thirty years of immortality.

Abruptly he looked up. "No, Nor-

gard," he said softly. "You are not going to fill that last cabinet. Either that horror is over—or the Master is over."

"You mean you're going to try the experiment anyway?"

"Exactly. It failed on a rat. It may succeed on a man. I will make a few slight changes in the technique. Then I will make the experiment."

Norgard smiled softly.

"Very well. But whose blood will you place in my body——" He glanced toward the row of cabinets. "I suppose you can use theirs."

The Master shook his head.

"No, we will experiment on my body—not yours. You will remove my blood, recharge it, and return it to my body."

Norgard sprang forward.

"You can't! Don't you see! If the experiment fails you will die. Where will the world be then?"

"You forget that you are speaking to the Master."

Norgard's voice was hard.

"And you forget that there is one thing which the Master cannot do—take his own life."

"Don't you think I know that?" The Master's voice was charged with a stinging bitterness. "That fact has been with me day and night for a thousand years. My life has been guarded as nothing else on this planet. And the world has come to think of me as a part of its machinery. They forget that I am a man."

"You are not a man. You are—the Master. And—you have no right to do it, Master."

"It's my life, Norgard. You can't get around that fact. Even the law of this country allows a man to do with his life as he sees fit. That law is older than the Master. It is as old as life itself."

"But it isn't your life. It is the life of those thirty. And the law forbids

murder—you would be killing civilization."

"I am sorry, Norgard, but I'm past caring. It may be that man can never beat the machine. It may be that he will find some new solution if the Master is removed. I simply know that I refuse to face another thirty years in a world that dies about me."

"I do not expect you to understand. The experience of being immortal in a mortal world is something which I hope no human brain will ever have again." He paused. With an effort, he brought his voice under control. "We will now proceed with the experiment."

NORGARD'S voice was pleading. "Please, Master. Remember it is not your life."

The Master did not seem to have heard him. He turned and started into the smaller laboratory. At the door he stopped. His voice was cold, precise.

"Norgard, I will now explain to you my method of rejuvenating blood. I will then seal myself in one of these caskets. You will remove my blood, rejuvenate it, and return it to my body. The details——"

Norgard sprang forward. His big hands grasped the Master's shoulders, the fingers digging into the flesh.

"No—I tell you—no!"

The Master's voice was still toneless.

"If you persist in this attitude, I will have you sent to the prison camp on the Moon and have the committee appoint another donor."

"Master, you will not perform the experiment."

The Master jerked loose from Norgard's grip and turned to a small television set. He snapped a lever. Hubbard's face showed on the screen. The Master spoke quietly.

"Call the committee of scientists and the city authorities. Tell them——"

The Master's voice stopped abruptly. His body slumped against the wall and slithered to the floor.

Norgard stood above him, still holding the heavy insulator he had picked up from the bench. Slowly he knelt beside the inert form of the one man who could guard men from the machine. A swift examination made sure that the blow from the insulator had not harmed the Master, beyond a possible slight concussion.

Having finished his examination, he bound and gagged the unconscious man. Then he seated himself at the central table and stared at the long row of cabinets.

The buzzer of the television set sounded sharply. Norgard got up and crossed to the screen. Hubbard's frantic face flashed into view in swerving light.

"You called, Master. What am I to tell the committee—"

Norgard cut him off. Muffling his voice with the back of his hand, he spoke without snapping on his end of the television set.

"Sorry, Hubbard. It was a mistake. I thought the central power plant was weakening—couldn't get enough power. I found where the loss was. I'll call again if I need you."

Hubbard's face stared uncertainly for a moment. Finally he said obediently, "Yes, Master."

The screen went dark.

Norgard turned away and went into the smaller laboratory. He stood a long time looking at the bloated body of the rat within its little cage. Then he returned to the outer room.

He drew back the curtains from all the cabinets and studied the features of the young men within their iridescent tombs. At last he sat down at the table and smoked another cigarette.

The big chronometer on the wall

sliced off the seconds. The dynamos purred steadily.

Barrett Norgard finished his cigarette and stood up.

VI.

SLOWLY the blackness in the Master's brain became gray. Gradually the grayness changed to the light of full consciousness. The Master glanced about, moved. His mind was searching for the piece of the jigsaw puzzle of thought which would make the experiences of the last few minutes whole.

His head ached dully, but he scarcely noticed it. Something of far greater importance was surging within him. He looked at his worn, wrinkled hands. Already the flesh was filling out, becoming firm and young. He felt the pound of new vitality throbbing in his body.

It was not a new sensation. He had felt it many times before—once every thirty years.

Only this time there was some vague difference—that one missing piece of thought.

Suddenly it flashed back—his conversation with Norgard—his turning on the television set—then blackness.

The Master thrust open the glass door of his cabinet. A premonition of disaster screamed through his brain. With the spring of muscles returning to youth and vitality, he stepped to the end cabinet and tore back the curtain.

Within swirled the luminous mist, scintillating with a dazzling kaleidoscope of color. But the Master did not see the mist. He did not hear the buzz of the television set.

He saw only the face of Barrett Norgard. Straight and powerful the young man stood there, a quiet smile frozen on his motionless features.

The Master's door of escape from deathlessness was shut now.

Irony crushed in on him. Barrett Norgard wanted life. And he had given

it up. The Master wanted death—and he had eternal life.

Backwards—that was it. The whole world was backwards. The human race created machines, and then the machines made slaves of their builders. In a universe that was timeless, man strutted about for brief specks of time, followed forever by the inexorable shadow of minutes, and days, and years. And in that time span between blabbering babyhood and disintegration he vacillated between a bestial love of strife and a stupid idealism. Like the foolish idealism of the young man in the cabinet.

It was a dull, hopeless game; a game that ought to end. Well, let it. He couldn't be expected to keep it going singlehanded through eternity.

His mind swept down the vista of the next three decades. His friends would die. The men and women with whom he had laughed the day before would seem old to-morrow. He glanced once more at his hands. Already years were gone from them. In a week they would be the hands of a man of twenty-five, as young and powerful as those of Nordgard.

But his mind wouldn't grow young. You couldn't turn back the clock of consciousness. His brain was still old, a thousand years old—and very tired.

There was a way to stop this insane mockery. Swiftly a decision was taking shape in his mind.

He had but to step back into that empty cabinet, connect the tubes to his arm, cut the connections, and throw the switch. His blood would be pumped from his body and form a futile little puddle on the floor. The swirling mist of oblivion would close around him, solving all problems. His body would fill the last empty cabinet.

Swiftly, he turned to the buzzing television set. His voice was brief, crisp. "Stop bothering me. I'll call you when I need you."

BUT HE would never call. Eventually they would break into the laboratory. But that wouldn't do any good. The maze of apparatus would be meaningless to the technicians, each chained to his own little field of science.

They couldn't do anything. They could just stare at his face in the gleaming mirror. He would be smiling, as Nordgard was smiling—only for a different reason.

For a few minutes he busied himself adjusting the pump and disconnecting the hoses. On a sudden impulse he went into the smaller laboratory and stood looking at the dead rat.

The little room seemed full of his hope and failure during the millennium he had struggled there. Struggled to create a super science—that had achieved the magnificent result of killing a rat.

It wasn't any use. He had tried everything—everything. All the accumulated science of a thousand years had gone into that last experiment. Perhaps, after all, there were some things that man's science could never solve.

The collapse of his hope drained his faith in the experiment. He saw now that the death of the rat had been conclusive. If he tried it on himself, he would only die in bloated torture, instead of slipping instantly into oblivion with the click of a switch.

He turned quickly and strode into the other room. It was a fitting thing he was about to do—much better than merely destroying himself. Let the scientists try to figure out what it was all about. Let them try to understand what had gone wrong—and why he should lock himself in an iridescent vapor—and why he should smile.

As he passed his desk, a wisp of white paper caught his eye. He paused, then went on. He was no longer interested in any information a slip of paper might be able to convey. He was weary of reports, and data, and statistics.

—of the paraphernalia of bungling human science.

But his mind wouldn't let go of the piece of paper. He remembered that his desk had been cleared when he had been talking to Norgard. Curiosity pulled him back. He picked up the paper. The brief words stared up at him. It took him a moment to force his mind to meet them halfway.

*You said my lens was short focus.
Don't forget that yours is, too. A
thousand years is an instant in the
destiny of man. The drinks will be
on me when you get me out of this
damned box. Yours for fewer dead
rats.* "BARRETT NORGARD.

The Master of the science of the world stood motionless in the center of the great laboratory. His strong young hands crumpled the bit of paper.

Each word of the scrawled sentences seared itself into the depths of his brain. Over and over again his mind repeated: *a thousand years—still too short focus.*

Slowly he crossed the room and faced the man smiling from his living death. The Master's hands went out and pawed the glass. His fingers left long, sweaty marks. His lips pressed against the glass worked, but no words came.

BEYOND the glass were the calm, steady eyes of Barrett Norgard. All the force of life seemed concentrated in those eyes, the same force that had relentlessly driven life onward, up from primordial swamps, up through millions of years of darkness, onward to the conquest of Earth.

There was one more step. A little matter of finding why a rat had suddenly died—

Suddenly the Master jerked about. There was the tiny click of the television switch.

The Master's voice rang through the room, big and powerful.

"Hubbard, call the committee of scientists. Get a list of the most promising men in the fields of bio-chemistry, radioactivity, and force fields. Arrange for the building of new laboratories. Get moving. We've got things to do."

He swung about, and went back to the last cabinet. His tight-lipped smile matched that of the man in the swirling mist. The Master spoke softly: "I'll stand the drinks."

Outside the dawn was breaking. The day's heavy power drain was beginning. The purr of the dynamos below the building rose. The building trembled with a surge of power. The giant generators screamed defiance at the universe.



Once in
the saddle
An' ridin' the range,
It's "Change to
Mint Springs
And Keep the Change."



Champion Distillers Co., Incorporated
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*The deadly radiations of
the Giant Planet were taking
toll — Darnell was weakening —*

Commercial war enlists an unfriendly race—

WITH slitted, sardonic eyes, Spacecraftsman Ted Thorp glared at the judge and at the man who stood beside the dais in the Place of the Denouncer. Through the stillness the words came clearly as the Qonian enunciated them in the lingua

franca of the planetary code. As with all his race, the gray skin contrasted strangely with golden eyes as cruel as those of a hunting tiger.

"Before the honorable court of Qo, Earthman, you have been declared guilty of invading the secret world in defiance

Duel In The Space Lanes

by William C. Beckett

of our law." Harq Kaffa, Lord of Qo, smiled as he went on, leaning back in the tiny chair which was less than half Earth size. "The penalty for espionage is—death. At dawn you shall be given to the space from which you came."

"You Judas," Thorp spat at the Earthman in the yellow United Spacecraft uniform. "Deacon, you lied. You know I landed only for repairs. I—"

The curt, sneering smile on Deacon Darnell's dark, narrow face did not change as Harq Kaffa shouted, "Silence! Guards, to the cells with him."

From either side two gray-skinned Qonians lifted short, slender, silver-tipped rods above their heads, focusing them on Thorp's belt. The tips glowed amber as the inertia rays began to turn him, pushing, pulling, throbbing in his flesh with a dull hurt, until his tensed muscles gave in and did their bidding. Thorp walked enveloped in the amber cloud down a corridor leading from the judgment hall to the cells. Walls, floor, ceiling—all shone with the bluish-white luster of osmium. The cell itself was bare, the window a grating of osmium bars, the door like a space lock. Within, a silence as of outer space enfolded him.

"About as much chance of getting out of here as I'd have of flying without a rocket," Thorp spoke with a wry grin. "Wonder what the scenery is like? Might as well see it now. I haven't much time left to look at it." Like all experienced pilots of the lonely space lanes, he talked aloud continually.

Through the grating, Thorp could look over the metal city beneath him,

silent now in the brief night. His eyes followed up a girder fashioned like an earthly spider, its eight arms supporting the translucent metal plates which were above every Qonian city. Any one who had ever flown a ship within the orbits of Jupiter's moons could explain the purpose of the protective roof and the disease that made it necessary.

The Qonians called it "the sickness that eats," a virulent disease caused by even slight exposure to the invisible radiation poured from the giant mother planet. Earthmen called it cancer, but it was a cancer accelerated so enormously that death was a matter of only two hours. So far, only the translucent metal cypras from the Jovian system was known to screen off the deadly emanation, and could do so only at a distance. The limiting factor appeared to be about two hundred thousand miles—which was the reason Satellite Five, the nearest to the mother planet, was still unexplored.

THORP knew that they were in the shadow of Jupiter now, but the plates above the metal city were luminous. Almost a tenth of the sky, it seemed, was blotted out with a mass which momentarily seemed to change position as Io sped along its orbit. Even through the metal plates Jupiter was lovely. Glowing from within, its axial spin clearly displayed nine brown, red, and olive-green bands to the little moon in its orbit two hundred and sixty thousand miles away.

Thorp turned from the grating. As he paced back and forth in the narrow confines of the cell, thoughts formed

in his mind and he began to talk to himself. Saying things aloud seemed to make them clearer.

"Quick and clean, that's what. Easier to die in a space lock than to rot in a radium cell for weeks. Deacon's smart. By turning me in he gets on the inside orbit with Harq Kalfa, or my navigation's off."

Swiftly he reviewed his latest voyage. It had happened long after he had crossed the orbit of Europa. With the thrust block of the right rear rocket-tube loose and hurling him seven degrees off course, it didn't take a master mind to decide to land on Io, law or no law. And it didn't take a master mind to know that Darnell had been responsible for the red flare of tubes Thorp had seen between Europa and Io. But by the time the tube was repaired and Thorp was ready to begin the flight to Satellite Five, there were Darnell and the Qonians around him. And very insistent that he stay on Qo—permanently.

Thorp shook his big shoulders inside the green Interworld Transport uniform he wore, and passed a horny hand tenderly across his red-bronze hair.

"Those little fellows pack some wallop in their force rods. They aren't over three feet high, but from the way my head feels they might be thirty."

He didn't need to guess about Deacon Darnell. Thorp knew Darnell as well as he knew his own instrument panel. For the last decade Earth had been starved for metals. But not for the common metals; mankind needed, and must have, the heavy metals Earth lacked in quantity—the osmium, iridium, platinum, rhodium, palladium and ruthenium which alone could resist the intense incandescence of the rocket tubes and the skin friction of space ships in an atmosphere. To metal-hungry Earth, the very dense moons of Jupiter were treasure.

Ted Thorp admitted to himself that the Qonians kept themselves secluded

with good reason. For the history of Europa, Ganymede and Callisto was a greedy shambles of ruthless exploitation. It was with reason that the men of Io, or Qo as they named it, had closed their world to all Earthmen. And now the rivalry of United Spacecraft and Interworld Transport had reached such a pitch that one Earthman would betray another to obtain the advantage in the quest for the rare metals.

"By turning me in what does Darnell do? Easy to guess that," Ted muttered. "He poses as a friend to Io, gets me killed off, and when the time is ripe he lets in United Spacecraft and gets his share of the loot. Smart, that boy!"

The osmium walls had perceptibly lightened in color. Dawn was near. Thorp sensed through the dense metal walls the slight whisper of motion outside. They had come for him.

ONCE AGAIN enveloped in amber light, Thorp paced ahead of his two vigilant guards. Without effort they guided him down a different corridor by the use of the inertia rods. Inevitably, Thorp approached the gleaming silver ovoid hull of space ship X-3729, where it lay in the courtyard, like an enormous drop of water glinting in the sun. His nose tingled with the sharp odor of ammonia. But the concentration was very little greater than that on Ganymede. One could bear it with practice. And Thorp had had plenty of practice in the past ten years on the Jovian satellites.

Darnell stood near the entry port. "Didn't want to miss the execution," he said, smiling.

Thorp grunted. "Changed colors again, huh?" he asked.

Darnell fingered the jewel like a crimson fire on his breast. Abruptly he changed to English. "This ruby, you mean? Given to the Preserver of Qo—meaning me—for the capture of one who is probably the greatest enemy to the peace of the realm of Qo—meaning

you. Nice, eh?" He smiled gently. "It carries with it the rank of fourth noble of the satellite and the command of this squad in charge of executions."

"Yeah. I know." Thorp kept his face impassive. "When does United Spacecraft get in?"

Darnell's face twisted; then he smiled, though with an effort. "Not until after the execution, Thorp. And you'll have company. Six Qonians drop into space with you. But they won't bother you; they're still already with *quajr*. I'm looking out for you, though. You don't get any, so you'll know all about it when the port begins to swing." His voice rang with iron finality. "We're using your ship for the execution; the Qonians are anxious to handle the latest type of our spacecraft. I'm going up in my own ship to observe the—er—last rites. Any final messages?"

"Not by you, Darnell." Thorp stared at the metal-paved yard, striving to keep his face calm, his manner hopeless. But his eyes glinted with newly awakened optimism. If they used his own space cruiser, there might—just might—be a chance. An outside chance, maybe, but in the space lanes you lived only by taking chances. Evidently Darnell hadn't had time to look over the equipment of X-3729, or else had forgotten that "X" denoted an experimental ship.

"Darnell." Thorp spoke with his eyes still downcast. "Maybe I won't see it. But the Space Patrol will get you for this. Sooner or later they'll get you. And when you get yours, I hope it's slow and painful."

"Don't give me ideas, Thorp, or——" The words floated back over Darnell's shoulder as he swung toward his own blue spheroidal craft.

Involuntarily, Thorp tensed his muscles, clenched his fists. The little gray guards snapped alert, swung their silver-tipped rods higher along his body. Thorp felt a staggering lassitude close in around his heart. He relaxed.

One of the guards spoke. "No move, red giant, or I paralyze."

Thorp nodded. He needed all his strength and speed. He dared not risk a shock which would slow the smooth working of his brain and nerves.

The guard spoke again. "Now you go. Forward."

Enveloped in the amber cloud, Thorp paced ahead and entered the space lock of his ship. The guards forced him along until he was well within the bore of the port and out of the way of the tiny technicians who were already swinging the ponderous mechanism shut and adjusting the remote control release. Six Qonians were lying in dragged sleep close to the port. They would never know the moment when the door swung outward and the cold emptiness of outer space turned their bodies into vast white puffs of lifeless matter.

The technicians finished their work, left the lock. The guards backed out, closing the protective grating. But they kept their positions outside. Thorp knew what that meant. They intended to watch him until almost the moment of execution. He said with grim amusement, "Darnell must have plastered his own reputation on me."

SUDDENLY the ship shuddered. Through the insulated walls the dull thunder of the rocket-tubes penetrated only enough for Thorp to sense the vibration, felt rather than heard. A feeling of increased weight told of rapid acceleration. His trained senses told him of each step taken in the control of the rocket. He knew when they had passed through the automatic photo-cell controlled gate in the metal roof by counting seconds. Immediately thereafter the steps in acceleration became increasingly jerky. Thorp thought disgustedly, "They've got a lot to learn yet about space ships."

Through the thin atmosphere the ship sped on. As the resistance diminished,

the dull sound of the rocket tubes died out. The ship was already beyond the shallow atmosphere of Io. Thorp shook himself, stretched arms and legs, and moved back and forth to loosen up his muscles. Unobtrusively he took a position on the port side of the tube where a boss protruded. The guards said nothing, although they peered at him with their evil golden eyes. He was harmless, their actions showed.

A technician joined them suddenly. He began to inspect the sealing gasket minutely. Finally his head nodded. He was satisfied. The three glanced in again at Thorp with malevolent faces and swung the disk which sealed the tube.

As the disk clanged shut and the gasket made the seal, Thorp sprang into action. At any second the outer port would open and let in the cold dark of space. Thorp reached for the boss, turned it. The metal gave in his hand. A section of panel slid inward, revealing a miniature space lock. Thorp grinned. When he had had that port installed as a convenience in taking tools in and out of the ship without disturbing the main disk, he certainly hadn't expected to need it as badly as this. Without a second's pause he jack-knifed into the port. The panel slammed behind him.

With set face, Thorp jerked down a space suit from its rack, slid into it and sealed the helmet. Safe for the moment. But the crew, what of them? At least fifteen aboard, far too many to tackle alone.

"It's them or me," Thorp muttered. His face grim, his mouth white and pinched, he reached out. The panel slid open again. Thorp opened the disk concealed in the tool-room wall and dived to grip the space-suit rack. As he did so, his ears heard dimly the preliminary whine of the outer disk release. The port swung open. Simultaneously air screamed past Thorp. In thundering sound, space and cold possessed the ship.

So quickly had it been that Thorp unclenched his hands as if he were dared. The cold began to bite in. He moved as in a dream, his hands adjusting the temperature control on the suit until he felt warm again. Mechanically he sealed the port. Moving to the tool-room window, Thorp retched violently as he saw six iridescent mushrooms already moving in orbits about the ship. "Them or me," he said, "them or me."

Moving like an old, feeble man, Thorp gained the control room. There were white, formless things here, many of them. With face averted, he walked toward the panels. In the pilot's position stood a great metal colossus, at least seven feet tall. Like a great box with arms the giant loomed over the controls, his four huge hands on the rocket levers and his photo-electric eyes scanning the course.

"Roaring rockets," Thorp yelled. "Look what those apes did to my ship. Four manual controls now just for that blasted mechanical man. Get back there!" He shoved the metal man backward on his track to his position against the wall.

THORP TOOK the controls, cursing again the awkwardness of the double levers. He switched on the tanks to replenish the atmosphere and began to scan space for a glimpse of Darnell. The blue ship would be somewhere near, he knew.

It was near. A red flare of rockets ahead made a vivid splash in the darkness of space—blazed brilliantly against a backdrop of black velvet stars. The vast, oval, banded orb of Jupiter pulsed with varied colors. Back of the ship, Thorp could see Io like a yellow orange, and still farther out the blue disk of Europa and the reddish-gray of Ganymede.

Thorp was ready. The blue ship came rushing back with increasing acceleration. Darnell evidently wanted to im-

press the Qucians with a spinning stop, Thorp thought. He estimated his position as at least thirty-six thousand miles from Io—enough space in which to move around. Glancing into the double eye of the range finder Thorp began to count. "Ninety, eighty, seventy, sixty—ten miles per second. Forty, thirty, twenty, ten—ah!" His hand closed on the magnetic grapnel release, jerked it to aperture seven. As the silent, invisible ray leaped out, Darnell's blue craft seemed to double its speed. But before Darnell could crash into him, Thorp slammed down a lever and twitched a knob to graduation ten. A pencil beam of vivid orange sped out on the same path as the magnetic grapnel. The blue ship stopped, jerked violently, shuddered as it crashed head-on into the force ray. As if it were welded to a steel beam, the blue craft held its distance from the silver ship.

Thorp waited for a sign of life from the other. He soon got it. With rockets flaming in red fury the blue craft spun. It jerked, spiraled in vast helices with rockets flaring now on the port side, now on the starboard. To Thorp, the night of space was lost in vast red flames that circled the firmament. Jupiter and Io spun, mixed interchangeably as the X-3729 looped and danced with the ship on its tether. But Thorp was smiling. He had seen all this before. The end was sure, for no space ship made by human hands had force enough to break these bonds.

Now he began to taunt Darnell, to play with him temptingly, using his own rockets to modify, to accent, or to retard their joint motion. The spinning became wilder—a cataclysmic battle of opposing power, titanic forces joining to fling the tiny ships through the immensity of space with ever-increasing velocity. The centrifugal force became almost intolerable, dizzying the brain and numbing the senses. But the result of the tremendous effort was nil; the blue

ship was still bound when its rockets ceased to fire. Thorp cut his own tubes and the twin ships continued to revolve about their common center of mass.

Darnell hadn't quit. Through the pilot's dome Thorp saw the projector on the other craft begin to spit a curious copper-red beam with a green core. The ray splashed over the osmium hull, drenching Thorp's eyes with flame. Again and again the beam attacked—a furious, coruscating brilliance searing the hull as the pulses came in momentary intervals.

Thorp was watching his exterior bolometer which was skyrocketing at a prodigious rate. This ray was something new, unheard of! Radiant energy which transformed completely into heat on striking matter. And he knew of no weapon with which to fight back. All he could do was to watch the hope that the hull wouldn't fuse.

CAUTIOUSLY at first, then more quickly, Thorp used his tubes, accelerating. While the ray yet splashed his ship with color and heat, he set his course straight ahead toward the center of the mighty banded disk looming over them. Fifteen miles per second—enough. About an hour and a half to the Jovian atmosphere. Thorp frowned.

"Too long," he muttered. "The old girl certainly will overheat. No refrigeration."

The shell temperature was still climbing. But more slowly. Up—2500°—only 200 more and the hull would begin to drip molten metal. Thorp kept his eyes trained on the bolometer dial, hardly daring to breathe. Two minutes passed—up 20°. Two more—five degrees. Two more—steady. Two more—steady. Two more—going down! Thorp belched hoarsely in triumph.

Darnell knew that he was wasting precious power, for the ray snicked off. Under the steady blast of the silver ship, the two raced onward toward the

Jovian disk. Thorp waited grimly for the next move.

The only warning he had was the faintest whisper of metal on metal. He was stooping under the panel reaching for a tool. As Thorp turned, the breath went out of him in one long gasp. The robot pilot was loose. Looming over the pilot's chair, the vast arms were closing. A dull crunch—the scream of tortured metal—and the chair was a useless mass of scrap.

"Rockets! Sizzling rockets!" Thorp yelled. "Telecontrolled, sure as Saturn has rings!"

His arm went back, then forward. Hurling with all his strength the heavy wrench sped true—straight for the robot's eyes. Glass tinkled. Thorp sprawled aside. The blind colossus heaved backward, its arms pawing aimlessly.

Dripping with sweat, Thorp wasted no time recovering balance. Crawling under the four huge paws that swung in random-biasing arcs, he dove frantically for the power cable controlling the robot. He seized it as claws ripped into the shoulder of his space suit, heaved slightly. The cable tore out.

"Whew," Thorp wiped his forehead, rubbed the tingling muscles where the claws had gripped. "No more chances with this baby! I'll have nightmares for forty weeks straight."

Shoving the metal man—now harmless—into position against the wall, Thorp chained him there.

"That's just so you won't walk in your sleep, Oscar," he said mildly.

Once again in the pilot's dome, Thorp used the double-image micrometer, taking a reading in degrees of arc of Jupiter's disk that now drowned out the sky with its variegated sheen. The observation—Ted slipped through the tables, found the reading. Twenty-five degrees, a little above 200,000 miles and approaching at a velocity of more than 15 miles per second.

Thorp glanced at the blue ship he was forcing along ahead of him. There was no sign of life from the other craft. All the more reason to be watchful. Darnell was doubly dangerous when he made no sign.

"Hope you like the joy-ride, Darnell," Thorp said with vast irony.

THERE WAS no time to say more. For already the ships were within the danger zone where the translucent screen of cyprus metal no longer protected from the Jovian emanation. Thorp grasped a heavily armored cable, inserted its triple-pronged plug into a receptacle on a shining new panel above the instrument board. Plunging shut a switch, he watched as the frequency poured into the outer shell built up.

"If the equations are correct," he mused, "the electromagnetic wave of the seventeenth octave should neutralize the emanation by interference. If it doesn't—good-by, Theodore!"

At any rate he would soon know. If the emanation penetrated, there would be a mild skin inflammation; perhaps a sore like a boil would suddenly appear. Then the high fever that swiftly followed, a fierce gnawing within the very cells of his body which would swiftly lead to delirium and death. Thorp remembered only too well how other pilots who had voyaged unwisely near Jupiter had looked when they were found—rotten husks that had been men.

He pulled down his rocket control to the graduation marked "For Grave Emergency Only," feeding more and more fuel to the flaming tubes. Speed mounted. The great disk ahead leaped toward him. Acceleration—45 yards per second per second. Thorp calculated swiftly. About twenty minutes of this, aided by the gravitational stress of Jupiter, would put him somewhere near the danger line, but where he could still parabolize the orbit—if the strained tubes didn't blow the ship into atoms.

first. By that time Darnell would be helpless—he hoped.

The blue ship woke to flaming life. Rockets blazing, the twin ships jerked in violent, swinging spirals. The heat ray flamed over the white ship. Darnell was risking everything in one cast of the dice.

Thorp watched the bolometer dial climb. Higher, higher, higher—would it never stop? Darnell was throwing all his reserve power into the ray this time. Through the pilot's dome the hull began to look oddly pitted and worn. A thin spray of metal drops gathered on the rim of the port.

Thorp kept close watch on his skin. Not a sign of rash yet, not a sign. "Boy, it worked like a chronometer," he muttered.

The blue ship was acting queerly. The rocket tubes flamed and ceased at random. The heat-ray projector no longer focused on X-3729; it moved in erratic ellipses. Thorp knew the signs. Delirium! Unless—Perhaps Darnell was shamming. Thorp shook his head—no more risks with that bird!

Brighter, growing momentarily, the Jovian orb loomed over him. He kept his eyes on the degrees of arc, counting until the disk was too great for the range of the instrument. The time was approaching. Less than five minutes away from the planet Thorp fired his landing rockets, cutting out the pro-

pellors. Jerking the panel releases simultaneously, he cut off the magnetic grapple and the force beam. The vibration of the fore rocket-tubes cutting down the terrific velocity called his attention. Satisfied that he could still parabolize his orbit sufficiently to miss the rim of Jove, Thorp turned again to the blue ship.

Hurled onward with its own momentum and fast caught by the mighty grip of Jupiter, Darnell's ship was dwindling. Tinier and tinier against the shifting, mottled bands, it gained velocity as it never had with a living hand at the controls.

Thorp shuddered. "Even if he's alive, nothing can stop him now," he remarked. With fascinated eyes unable to turn from the inevitable disaster, Thorp counted the minutes. One gone. Two gone. The blue ship was a glowing dot in the Jovian atmosphere. Three—and now there was no trace to show that the space ship had ever been.

For a long moment Thorp stood silently gazing at the ever-changing bands of the monster planet. Finally he spoke. "So long, Darnell."

Turning to his control board he spoke again.

"These babies in white can wait until I get beyond the emanation." With steady hands, he set his course for the Interworld Transport base on Ganymede.



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Jason Sows Again

by

Arthur J. Burks

A two-part serial of the problem of a modern Tantalus—a general with the greatest weapon of the ages—and unable to use it!

NOTHING human, it seemed, could stop the march of the fifty million. The world had waited too long. Three decades before, there had been but two or three million—five



at the mast—and they hadn't seemed important. The nations outside the Orient had recognized the growing danger, but each was jealous of all the others, and none would take the lead in stopping the evil growth before it became too dangerous. And no two nations could work in harmony.

So—fifty million who were not afraid to die were marching—

IT had really begun in 1931, with the formation of the puppet state of Manchukuo, under the rule of a feeble emperor who was putty in the hands of those who had placed him in power. Then, great bites had been taken out of China. Jehol. Chahar. Chihli. There seemed no extreme to which the aggressor nation would not go.

In 1939 it cast out the puppet emperor, and no one even knew where his bones were buried, or his ashes scattered. His need had passed, and the true emperor ruled the vastest nation on the face of the globe in point of numbers. And every child of that great amalgamation came into the world believing that the emperor was God, and that to die in his service was to achieve immortality. Thus was terror of death banished from the mind of the vast, growing horror before even that mind was capable of knowing death. Not difficult in a land where fatalism was the breath of human nostrils.

And, prepared though Uncle Sam was, he did not know that the fifty millions were marching until they struck. They struck as no army in the world had ever struck before, save the armies of the Great Khans—or as those armies would have struck had their number been in the many millions.

Submarines! The most tremendous ever assembled anywhere. Nobody knew how their secret had been kept, nor where they had been put together—until the knowledge was of little use.

Then it was known that they came into being far under the sea, far down toward the base of Kita-iwo-shima, a needle of rock that rose out of the depths of the Pacific. Brilliant brown inventors had devised a means of penetrating the rock to the depth desired, then building out from it on all sides vast undersea shipyards which even the angels could not have found. And then, when they had builded their ships, they sent them forth to the east, like arrows traveling under the surface, faster than arrows had ever flown.

And each was first packed through all available space with the best armed troops ever banded together—troops who had marched and counter-marched for years in Chinese areas denied all those years to foreigners of every description. Only the vaguest rumors had seeped out of those vast parades. Rumors which spoke of gases to stun the minds of men. Rumors that spoke of projectiles whose very whisper was death, whose exploding would devastate municipalities and counties. Rumors of weapons even the creators of tales of tomorrow had not dreamed of—

They struck like thunderbolts of doom on a certain morning never to be forgotten. Monsters rose from the deep off the West Coast of North America, over against San Diego, and San Francisco, Portland, Seattle, Vancouver—nor did the enemy care for a single instant that the attack on Vancouver automatically forced Great Britain into the holocaust. They gave no thought to Great Britain at all, for world conquest was their goal, and they would swallow all nations as they declared war, or whether they did or not.

Great shells smashed into the coast cities. Sounds so great and dreadful the mind of man could not believe them—sounds which drove the hearers instantly mad, so that they turned on one another and fought like dogs, in the streets, until the vast projectiles fell

among them, leaving only piles of bloody human clay where the mad ones had fought.

THE ARMY of Uncle Sam retreated, because there was nothing else it could do. Nothing human could stand before the landing parties of the Yellow Girdle, a name the great yellow empire had taken—somewhat ironically, too—as the Yellow Girdle had once been the sign and symbol of a dynasty that had, in its time, been great.

Fifty millions were marching—but first they came under the sea, seeking the western beaches for their alien feet. And before they landed their projectiles found the great cities of which the United States had always been so proud, and when the projectiles struck—lazily, so horribly lazily, because this was such a simple routine matter—buildings fell into dust even when they were not struck, and the actual paths of the projectiles were deep coulees in the earth, and in concrete pavements and sidewalks. Coulees whose hideous walls were tinged with the bright, red blood of those who had not had time to flee.

But even the greatest catastrophe the world had ever seen left some survivors. No cataclysm, of humanity or of nature, could wipe out everything human. The will to live gave many the chance to live—to die later perhaps, and even more horribly.

"San Diego in ruins," said the radio, screaming out the horror.

"Los Angeles in ruins,"—almost at the same instant.

San Francisco laid waste as a dozen earthquakes of 1906 could never have laid it waste. Portland destroyed. Seattle a crumbling, dusty ruin.

And out of the dust of destruction, where nothing, it seemed, could possibly live, came the survivors. Their eyes started from their heads, and few of them would ever see again. But they ran, incapable of tiring, to high ground,

as though they fled from monster tidal waves, groping before them with broken hands, while their prayers went madly up to a god who seemingly could not hear.

Millions were killed—yet millions came out through the dust of white humanity's disintegration, and made for the high ground, for the mountains to the east, where the Rockies and their children formed a barrier that even the fifty million would have difficulty in breaching. For the Rockies, down the eons, had known cataclysms before which even the fifty million were as nothing—

But even so, between the mountains and the sea, the Yellow Girdle, in the time between dawn and midday, in the year 1945, had planted countless feet to tread out the greatest colony of the new empire.

Remnants of the American army and navy escaped to the mountains to reform. Armies from the east traveled at top speed—in airplanes and trains—to the eastern slopes of the great rampart—and some of them survived. Many thousands died under the falling bombs of enemy warplanes. Many died of disease. But never had the courage of white mankind run so high, never had white mankind been so determined to survive, and save the great land he had conquered for his children and their children.

Men between thirty and forty were the first to go. Conscription was almost instantaneous, and when the men between thirty and forty were slaughtered, men on either side of those ages, the young and the middle-aged and the old, stepped into the breach.

And the young ones knew, even then, that their fathers could not save this vast land for them; that they must save it for themselves or perish miserably.

And so it happened, within two days of the first ghastly awakening, that a man twenty-five years of age, one Daryl

Strang, became general of the armies. Not since the early days of the Republic had one so young become a general officer. But the old-timers with stars on their shoulders knew from the very beginning that the high courage, the brilliant dreams, the dauntless ambitions of youth must be served. So they themselves cast about for a subaltern who was worthy, and Daryl Strang was Commander-in-Chief, under the President, of the Armies of the United States, and of such troops as the navy might detach for service with the army.

Daryl Strang was humble in his power, and old with the gift of reason, before even the four stars were on his shoulders. For he understood his responsibility; that the fate of the nation rested in his hands.

TEN MILLION men, unprepared, comparatively poorly armed, against fifty million! An impossible task. Yet Daryl Strang, from a high pinnacle of the Rockies, looked toward the west and whispered to himself a kind of prayer.

"No human being under heaven can do it—yet I must. No army can withstand them—yet my armies must. Human flesh cannot live through it—yet a way must be found."

He formed a staff. It was sprinkled with men grown old in the service, and with men younger even than Daryl Strang himself. The old men were wise, too, for they knew a situation they could not handle when they saw it. So they stepped back freely, to make way for youth—but gave of their advice, backed by years of experience, as circumstances demanded of them.

There was something about Daryl Strang—whose eyes were blue as the skies across which the Valkyrie soared in olden times, whose hair was almost red, whose shoulders were instantly broad with the weight of his responsibilities—which gave men confidence, when it seemed that confidence had been

hammered from the nation with the blasting of those grisly shells from the monster subs off the western coast of America.

Headquarters was provided with everything known to military science in the Occident, to advance the cause of war. Radio. Wireless. Telephones. Daryl Strang could sit behind his desk, deep in the catacombs under the Rockies which army engineers—a far-seeing group of patriots—had managed to get the government to prepare against just such a contingency as this, finishing them just three months prior to the holocaust, and see and hear everything that went on where the first of the fifty million set their feet upon the soil of the United States.

Great televisors showed him how the battle went along all the coast, from San Diego to Vancouver. South of San Diego the country was already lost, and Mexico was a vassal of the Yellow Girdle. In a matter of days, no more, the Yellow Girdle, filled with Mexican conscripts who must fight or die, would be menacing the southern border. Alaska fell as quickly and easily as San Diego, Portland or Seattle. The Yellow Girdle had started a pincer movement that was death for a nation, unless—

Unless somehow the brains of young men could work miracles. Deeper still in the catacombs, the brains of young men were busy with explosives, with new inventions in aviation, with gases, with germs of hideous disease. Their minds had been stepped up, years in advance of normal maturity, by the speed with which the Yellow Girdle had attacked. They were rising to the emergency.

Daryl Strang knew all this as he returned from his pinnacle, from his study, through haunted eyes, of the slopes that led down into the west, up which one day—maybe even to-morrow—the last of the fifty millions would begin marching. But the human eye could not see

everything. Television, adjusted minutely to military maps by an adaptation of the pantograph which Strang himself had invented, showed him instantly anything he wished to see. He needed only the map coördinates to complete the operation of seeing a given place anywhere in the United States.

His heart stood still when he looked into the west. Anywhere below the mountains into which civilians who survived had fled in madness and terror, while remnants of a once mighty army fought hopeless rear-guard actions against the projectiles of the fifty million who did not even have to step ashore to whip them forward in headlong rout, was chaos.

He saw the first segments of the landing of the fifty million. In a matter of an hour or so, followers of the Yellow Girdle stood ten deep, and shoulder to shoulder, the entire length of the coast—as though to show this upstart nation what they could do when they were really ready to fill the land with troops. There would be a soldier of the Yellow Girdle for every grain of sand on the beaches—or so it seemed at first. For everyone knew that comparatively few of the submarine monsters had shown themselves as yet—that hundreds, perhaps even thousands, were cutting the depths of the Pacific behind them.

Nothing was impossible to a new nation that could muster, with ease, and arm to the teeth, fifty millions of men.

DARYL STRANG studied his television panels, and saw segments of the horror. Masses of crimson in city streets—masses that had been men, women, and children. Slowly the crimson was being hidden, dried up by the falling gray dust that, only yesterday, had been mighty buildings, concrete pavements and sidewalks.

The ground between the foothills and the sea was dotted with dreadful dead. It seemed impossible to believe that, to

the east, millions still lived, millions still cried out for vengeance, and miracles.

Daryl Strang called his staff about him, and every face was grave. They, too, looked for miracles. He read it in their faces. They did not expect him to attempt the impossible—they expected him, somehow, to do it.

"They will consolidate their gains, gentlemen," said Strang. "Then warplanes, with bombs, with capsules containing disease germs, will fly over us, to harass civilians in our rear. Our own planes will fight against them as long as one can remain in the air. But the brunt of the defense must of necessity fall upon the infantry, the artillery, the engineers. The Yellow Girdle will be marching on us, outnumbering us beyond computation, within—at a guess—thirty-six hours. They won't take time to consolidate in detail, for their own projectiles have left little to consolidate. Even with broomsticks, their numbers are so great that they should defeat us—while, in fact, they have arms of all descriptions, better than ours, some of which we know nothing whatever about. Prepare your elements for defense. Our present positions will not be overrated."

So, calmly, he signed the death warrant of those who listened, and of the men they commanded, unless—

Unless a miracle impended.

"I never heard of a military order like this, gentlemen," continued Daryl Strang, "but in the circumstances it seems about all we can hope for. I am causing the following brief order to be transmitted instantly to every human being in my command: 'I call upon every military brain for a miracle that will drive back the enemy! What sort of miracle? I do not know. But our people have performed them in the past, must perform them now. A new projectile, perhaps, created overnight, out of the brains of our chemists, might turn the trick. A new gas more deadly than

any the Yellow Girdle has. A new gas that will neutralize that which they'll use against us to drive us out of these strongholds. Bombs the size of a grain of rice that can wipe out whole corps, whole armies—who knows? But such a miracle must be forthcoming if we are to survive."

The staff snapped into its duties. Radios sent forth their commands. Wire-less tapped out orders. Generals of corps and armies talked face to face with their subordinates via television. And with straight faces, as though they themselves believed fervently in the possibility of miracles, the generals of the staff called on their men of all ranks, down to private, for the miracles Daryl Strang had demanded——

And if the generals prayed a little as they sped the command for a miracle to the ears, the hearts and the souls of their subordinates, it was doubtless good for them to pray. It was almost all they had left—except for the millions under their command, who could only die like soldiers when the time came.

When the next morning came, the soldiers of Uncle Sam went out to die. Great warplanes were winging out of the west, bearing cargoes of abysmal destruction. Artillery, of the longest range yet seen by Americans, was laying down barrages for the myriads of Yellow Girdle soldiers already on the march—— A solid line of them, rank on rank reaching from north to south, and extending from the west coast inland like a great rubber band, stretching in the direction of width——

And still no miracle had come to pass.

Oh, a chemist found a new gas.

A ballistics expert invented and perfected a new cartridge which could be fired from a rifle, and would explode on contact, destroying everything for a quarter of a mile in all directions. And already those cartridges were being made in quantities and issued to the troops—being sent out from the cata-

combs that were at once factories and forts to all units of the American command, by airplane. One out of five planes reached its destination, for the warplanes and the invisible death-rays of the Yellow Girdle got most of them.

Mountain-shaking explosions would burst among the enemy. But Strang knew in advance that the enemy would close up the gaps and never miss their dead, because there were so many of them. Fifty million, on the march, while behind them, across the ocean that had dwindled by science to the breadth of a man's hand, five hundred millions more furnished food, supplies, and trained new myriads.

No miracle had come to pass.

II.

Yet there would be a miracle, at that. It was even now moving up the mountainside, in the shape of a man with a small black box in his arms—a thing that looked like a camera.

But his hand, both of his hands, were hideous, for they had no fingers. And he must have been a man of great courage, for he tottered along on the stubs of his ankles, because his feet were gone.

And he couldn't see what he was going, because his eye-sockets were empty.

Yet this caricature, this horror of a man, was the miracle for which a nation prayed——

His name was Jarl Harvey, and no one now lived who had ever heard of him. That he knew very well, for he had seen his family die, and his friends, before some queer thing had happened to him, that had taken his eyes. Gas, he supposed, that destroyed only eyes, and somehow, horribly left the brain behind them intact——

It was almost impossible to tell anything about him, or even for sure that he was human, because so many ghastly

things had been done to him; had been done to him despite the fact that no enemy hand had touched him at all.

There had been something else, just as he had escaped from Oakland. A something that ran along the ground, a creeping, lurking mist. And it had eaten away his shoes, and his feet, as though they had been nothing. And once or twice he had fallen, catching himself with his hands, and the crawling stuff had got his fingers, too. Only a miracle intervened to keep it from getting his hands, arms, all of him. To Jarl Harvey it wouldn't have mattered, save for one thing: *that black box he carried.*

His life was in that black box, but none in all the world knew that, save Jarl Harvey himself. And it wasn't only the life of Jarl Harvey, but the lives of millions of Americans—and it was such a small, insignificant box, so black and cheap-looking, to hold the lives of millions—

It was the mightiest military weapon of all time—yet could not injure any man—wherein it was the greater.

Jarl Harvey was, perhaps, twenty-three years old, and he had no reason to believe that the world had been made for youth—for he was youth, and the world had destroyed him. His eyes, feet, fingers.

And without his fingers how could he manipulate the box, and what he needed to create to go with it—another, larger box, much larger, that had been destroyed in San Francisco by almost the first big Yellow Girdle projectile that had screamed into the doomed city? One needed hands with which to build another box— One needed eyes with which to see what one built— Without eyes one might manage, but what could one do without fingers that could feel, and measure?

The case of the black box was hopeless, almost as hopeless as the case of Jarl Harvey himself, and of the millions he wished to save.

It was a ghastly thing to totter along on the bleeding stumps of ankles even after dirt stopped the blood from flowing, and the stumps were numb with pain. It wasn't difficult, if one had learned how to walk on stilts, and had one's eyes with which to see, and aid the balancing of the body. But without either it was a horror, and a torture beyond enduring—if the indomitable will of the man had not been stronger than that—at the moment—of any man living in the world.

The country needed a savior. Jarl Harvey would be that savior if he lived. He refused to die until he had become the thing he had to be if the nation would survive. He could never be sure how he guided himself, nor how long he had traveled. He kept the winds against his body where he knew they should strike at given hours of the day and night, if he traveled the right direction, for he knew the country hereabouts, and could travel it blindfolded. Which was fortunate for one who had no eyes.

HE GASPED as he ran forward, a horrid running. His breath rasped from his lungs, burning like fire. Blood trickled from the corners of his mouth, because his lungs were raw, and his tongue was gone, his mouth-tissues rotting away— But he knew, even handicapped as he was, that he would not die until he had been given his chance. He had been a fool that he had not given the secret of the black box to his government. It might have saved the country, thousands, millions of lives. Only he had been buried in his laboratory, and had scarcely thought of war.

"I will get there," he told himself fiercely, without sound, through his gasping mouth. "Somehow I will make my hands do my bidding. I will make them feel what I wish to do, make them do it for me."

The stumps of legs didn't hurt, not

really; for how could anything hurt a living man, who had seen so many blown to atoms? Who had seen—well, sights he would never put into words for a living soul, because there were no words to paint their picture. Just, simply, no words.

"I will make the headquarters," he whispered, hypnotizing his dying mind so it must go on—"I'll get to the commanding general, whoever he is. I will make him understand. But, dear God, keep him from believing I am insane! Thou knowest, Thou art the only one Who knowest, that I am sane!"

Straight east, into the high mountains, thence to the catacombs. Jarl Harvey knew where the catacombs were. No civilian had ever, prior to the holocaust, been allowed within a mile of them. Military fortifications, they said, secret from everyone who did not wear a uniform. Yet, he'd been in the catacombs, through all the stronghold, and knew where to go to find what he sought. He had always, since he could remember, done things he was not supposed to. Curiosity had led him everywhere. Curiosity had caused him to perfect the black box and the strange, awesome mechanism inside it.

He thought: "If I don't make it, and it falls into the hands of the Yellow Girdle! What hideous possibilities, when they already are so powerful, as numberless as the sands on the beach." Fiercely he drove it from his mind—repeated his hypnotic refrain—

They were coming, too, coming behind him, marching to the hills. He would have to work fast—never pause, never stop. Even had he been in the fastest plane, flying straight to his objective, it would have been too slow. But he traveled only on his stumps of legs—and that in itself was a miracle.

A shell fell, a mile away to his right. It fell in a ravine, and the ravine vanished. Jarl Harvey was flung end over end, away from the blast that would

have erased him into invisibility but for the protection that far ravine had given him. He clutched the black box against his breast, and prayed.

He wasn't, ordinarily, given to prayer; but what could a remnant of a man like Jarl Harvey do but pray? He was a miracle himself, but a miracle unperformed, a miracle due to happen, deep in the mountains, if by still other, and previous miracles, he could reach those mountains.

One projectile, he thought as he struck the ground heavily, instinctively guarding the black box with his broken body, which landed nearer than a mile, would destroy him. It must not happen. How else could he survive, if God did not help him?

HE KNEW the Yellow Girdle was marching, for he knew from the sounds the exploding projectiles made—a kind of pattern, reaching, probing up the foothills, into the deep mountains, feeling with fingers of steel for the lives of American soldiers—that they were a creeping barrage, sent ahead to warn those in the mountains that Hell was approaching—taking its time, but approaching.

Thousands, millions of the soldiers. Jarl Harvey, had seen some of them, close at hand. Last year, that had been, when his curiosity, and whispers he had heard, had taken him deep into the hinterland of inner China—into forbidden territory, to watch the Yellow Girdle preparing for war. He'd come home, written about it, and nobody had believed him.

But he did not forget. He knew those soldiers. Once, within the past ten years, they had been Japanese, Chinese, Mongol, Tibetan, Annamite, Korean, Manchukuan, Turki, Siamese, Indian, Tartar. Now all were welded together to form the Yellow Girdle. And each man was a walking arsenal, a hideous machine of destruction.

It was because of what he had seen last year that he had worked so faithfully on the black box and its insides. And when he had succeeded with his plan he had told none save his close friends and relatives, because all others would have laughed, and would have sent him to some asylum for the insane. Only his friends really knew, and his family—and they were dead. Even they had not believed in that frightful, harmless, black box. Now, even the pieces of them could not have been separated from the pieces of thousands of others, after a single projectile fell into Market Street, just above the Ferry Building.

How long ago had that been? Years—cons—yesterday— It made no difference, really, when time stood still, aghest at abysmal horror.

On, faster and faster. Who commanded the American armies? He did not know. Nobody knew, west of the Rockies, unless the Yellow Girdle knew, which was possible because the Yellow Girdle knew everything. They must know everything, to have struck so surely at exactly the right moment to cause the greatest havoc.

"I will make it. They've got to believe me—" the broken human thing mouthed queer mewling sounds—

Thin-whining things sounded, far to his right and his left—the dreadful bullets of the Yellow Girdle. Just one of those bullets, striking him anywhere on his person, would destroy all that he would do. Nobody would ever know. The Yellow Girdle would not know, perhaps, or ever find out—for the heavy feet of thousands would pass over the black box, grinding it into fragments, grinding it into the dust of ageless rocks already fine and gray from the hammering of heavy shells.

His panting breath was a sob, an endless sob. Only yesterday, as time moves when there are no cataclysms, he had been a schoolboy, and wanted to be a

great general. But when he'd got out of school he hadn't been very strong, except for his brain, which sometimes felt as though it were too big for his body. He used his brain.

He used his body now, amazed what it could do for him. He used his will-power, amazed at its might.

"But that's because of my brain," he told himself. "The brain is everything, man's part of infinity—and it is brain, and infinity, or the spark of the divine, that will defeat the Yellow Girdle in the end. Unless the invasion of the Yellow Girdle is in itself an act of an avenging god."

A COUNTRYSIDE covered with soldiers. Cities leveled, piles of dust that hid thousands of human bodies. Marching feet through that dust, over those bodies, until everything was dust and mud—

The world's biggest battlefield to date. And if the Yellow Girdle knew his secret! If they knew, and believed, every weapon at their command, he was sure, would be trained this instant on the staggering, stilt-tottering figure crawling up the mountainside like a snake with a broken back. The Yellow Girdle if it knew, would willingly sacrifice many of its millions to slay him, to destroy or capture his secret. The terribly powerful secret that yet could not kill, or maim, or hurt—

But they didn't know. To them—if any saw him at all—he was simply a bit of wreckage, a panting refugee with whom there was no need of bothering, unless some Yellow Girdle soldier decided to try his marksmanship on the wrecked body of Jarl Harvey.

Jarl Harvey might have been a brother of Daryl Strang, by his looks—if an observer could have seen eyes where there were no eyes, and known that they had been blue; could have seen that the hair, matted with blood and dirt, was almost red. But they were not brothers, and

neither had ever heard the name of the other. Harvey did not know that Strang was the general of the armies, for the projectiles of the Yellow Girdle had dropped a monster, ebon curtain between the devastated areas—and those who survived in them—and the areas to which the hosts of refugees and the remnants of the army had fled. For all Jarl Harvey really knew, all the United States might be but a continuation of the ruin from which he was fleeing. That he would have to discover.

Eons passed. Many of them. Sound was numb and thought was dead, and there was no feeling at all—simply the urge to continue, on and on, as fast as he could go. Thought was dead—but that hypnotic urge it had graven deep in his mind, before it failed, worked still on the automaton he was—

A rifle bullet smacked a rock near him, finally. He heard the sound of the explosion, and his heart hammered with excitement. That was a Springfield rifle, latest model, and an American soldier was firing on him. It would be ironical if he should have come this far only to be shot by his own. But he didn't blame the soldier for firing, for who could tell what sort of horror he might be, sent to destroy them by the Yellow Girdle?

Terror was behind that rifle, he knew—and was grateful for the knowledge—else the shot would not have missed. It had been fired by someone blind with terror, so that he could not align his sights, by someone shaking with an ague of horror, so that he could not hold his rifle steady. And for this Jarl Harvey was glad.

He tried to cry out, then remembered. He waved the black box aloft with both hands, for one alone could not hold it. He sobbed his relief that the armies of his own people were now so close. Close, yes. But the army of the enemy was close, too.

Planes flew over, dripping bombs.

Jarl Harvey lived because he was so small a target they did not waste a bomb upon him—though, had the flyers known, they would have concentrated all their warplanes on him, to make sure that he was dead.

All about him was war, bullets, bombs, gas. But he had come through this far, and having come so far he knew that no bullets of his friends could possibly slay him.

Finally he heard English words, good old-fashioned, emphatic cusswords, and he would have wept tears of joy had he been physically able. But one needed eyes if one would weep. Heavy hands grasped him. Harsh voices commented on his lack of feet, of fingers, and of eyes. One voice asked him: "How in heaven did you get here, without being able to see? Where are you from? What's that you're luggin'?"

HE TRIED to tell them, then remembered the thing he had forgotten. He opened his mouth and let them look into it, turning all the way around, so that they could see.

His tongue was gone, too. But he didn't mind that, because he was so close to victory, and so he laughed, and his laughter made the soldiers shudder, and chills to race along their spines. It made them draw pictures of horror in their minds—pictures of the scenes through which this travesty of a man had passed.

"He's got something important to say, Lieutenant," said one voice, "so let's get him back to headquarters. Though how he's going to tell, without a tongue, or write what he has to say without fingers, I don't know. But if he came all the way here from *anywhere* below the mountains, there isn't anything he can't do! I wonder where he did come from."

Hands fumbled with his coat, found the name of his tailor inside on the pocket.

"San Francisco! It just isn't possible? Were you like this when you left 'Frisco, buddy?"

Jarl Harvey nodded, and grinned, and one of the soldiers told him not to grin—that he couldn't stand it. One of them tried to take the black box, but he clung to it with such fierce tenacity that the hands fell away.

"The box has something to do with it, sir," said one of the voices. "I hope he ain't a Yellow Girdle spy, and that

*Broken—a thing without fingers—
feet—eyes—without a tongue to
speak, but only an inoffen-
sive, harmless black case
—this wreck of a man
was to defeat the
Yellow Girdle!*



ain't a bomb that'll blow the mountain out of its hole!"

Jarl Harvey didn't blame them for being suspicious of everything, even of him—especially of him—for he knew what the black box looked like, and what unbelievable things could be hidden in such a box. He felt men lean against him, put their ears against the box, to listen for ticking sounds, and he was glad that there was noise. For had there been, they'd have broken the box, to be on the safe side.

"Let's put him on a stretcher. Give him a hypo, doc, so he can stand it the rest of the way!"

He accepted the stretcher gratefully, but he fought at the hypo, and sounded so fierce, even to himself, and so satanic with his empty mouth, that they didn't give him the hypo, after all.

They carried him swiftly in the stretcher, and he was reasonably happy, though shells fell close, and they talked of a cloud of gray gas that was climbing up the mountainside behind them, speeding their steps. Men were killed beside his stretcher, and other men took their places, unconcerned. Death was so commonplace that men accepted it, now, as surcease from greater horror.

He protested when they started into the catacombs with him, and they asked him questions to which he could answer by a shake of the head or a nod.

"Want to see General Daryl Strang?"

He didn't know Strang, so he didn't nod or shake his head.

"Want to see the general of the armies?"

He nodded. Then he slid off the stretcher when someone went to fetch the general. He hooked the black box under his left arm, tightly. Then he dropped to his knees, crawled all about the face of the mountain, until he found a big clear space where the ground was dusty enough to retain the marks he must make.

HE WROTE in the dust with his right hand, huge, two-foot-high letters, so that all could read.

"The box must be guarded with all our lives until I have done my work! It is our salvation! It means defeat for the enemy!"

Some of the soldiers laughed. Some jeered. How could such a small box be a nation's salvation? How could a man so hopelessly smashed and broken bring about the defeat of the Yellow Girdle?

"Let the doc have him, or toss him to the squirrels," said a familiar voice. "Maybe he thinks he's the miracle that Strang asked for! The Old Man will have our hides for taking up his time with a nut like this."

Harvey, listening, wrote again.

"He will bless you with every breath he lives to draw from the moment you bring him to me!"

"The guy must think he's Alexander come to life," said another. "I'm telling you, if the Old Man loses his Angora on account of this buzzard, we'd all better stand under the next Girdle plane that goes over, and catch the bombs in our mouths. Get him away!"

But, came the heavy tread of authority. The feet of a master and his staff. And a voice Jarl Harvey was to hear often in the days and nights to come snapped: "What is all this, anyhow? If I've been brought here on a fool's errand—"

But Strang broke short off when he saw the human travesty—who was writing again, writing furiously with the stump of his right hand.

Maybe I am your miracle. There is a way to find out. I must have a room to myself, immediately. I must have a box of any size, so long as it is bigger than six by three, and deeper than two feet, inside that room. The box must contain ration components—300 pounds in all—in any form obtainable—meats, metals, condiments—and must be made radioactive. Your chemists will know.

And hold the enemy at all costs until I am ready.

"Hop to it!" snapped Daryl Strang to his amazed staff. "Maybe he's crazy, but maybe Heaven has sent us a miracle after all. And furnish him with eyes and with such things as he needs. And take care of that box, whatever it is, whatever it holds!"

And in spite of the fantastic impossibility inherent in every circumstance surrounding Jarl Harvey's arrival, there was something suspiciously like hope in the tone of the general's voice.

III.

The last thing the remnant wrote, before he went into the dark room they set aside for him, was as mysterious as the man and his box. "I want absolute privacy. I go in alone, come out alone."

What did a blind man want of a dark room? But Strang had issued commands, and they did as they were bidden. And Jarl Harvey clung to his black box, went into the room alone. They knew he did, for some of them stayed outside to make sure—and because they were curious, and it was an excuse not to watch the slaughter in the foothills.

Jarl Harvey went into the dark room, near the mouth of the main entrance to the catacombs, which a handpicked guard had vowed would never be passed by a soldier of the Yellow Girdle while one of its number lived.

And for half an hour those outside the door wondered what Harvey did there. Wondered and waited. But the Yellow Girdle did not wait. American soldiers were everywhere, under cover, guarding all entrances to the stronghold. They had little strongholds of their own, and from them, while Jarl Harvey worked in the midst of black mystery, they watched the warplanes of the Yellow Girdle spin overhead.

Bombs dropped on strongpoints, and hundreds of men vanished when the bombs struck. Pieces of them scattered along the mountainside. American planes of all makes—and swift as hawks, but like wheeling, filled buzzards when compared to the planes of the Yellow Girdle—plunged into the thick of the enemy planes, and fought until they burned and fell, or their pilots were shot to death.

Numbly, grimly, the soldiers on the ground watched the fights overhead, where friends and enemies circled the crags, dived along ravines, dropped bombs, fought with machine guns—and even with crates themselves, for often American crates, their pilots despairing of emerging victorious, dived straight into the bodies of enemy planes, if only to prove that it was possible for the enemy to die.

And the Americans knew that all this winged horror overhead, so thick that often the light of the sun was hidden, was but a prelude to the coming of the millions. Projectiles were clearing the way. Bombs from above were clearing the way. And when the foot troops came, and marched over the defenders—dying by thousands, but never pausing in their march—the attack by human beings upon other human beings would be as an attack by myriads of locusts on fields of succulent new grain.

Hell was overhead, ghastly, unbelievable hell. But it was as nothing compared to what was yet to come.

And in the dark room the man of mystery, whose name none in the mountains yet knew, did what he had come to do, behind locked doors. Why behind locked doors? Was he afraid that his secret would be stolen? By whom? Or was he afraid of failure that he did not wish anyone to see?

It was something for numbed minds to wrestle with, to keep them from remembering how horribly close was death.

Somehow Jarl Harvey had made them understand what he wanted, so that the black box, that looked like a large coffin filled with a strange hodge-podge of material—foods and rocks, ore and meat—had a heavy lid, and wires of several sizes ran into the weird mixture. And the wires were connected with dynamos, and small studs on the black box.

Jarl Harvey prayed that his stumps of hands be sensitive enough, and that what he had done would prove what he wished it to. If it did, Jarl Harvey would live again, and—

But he refused to tell even himself that the miracle was certain, for now that it was so close to the final test he was filled with terror. Those men outside were filled with terror, but all the terror of all of them through whom he had passed was as nothing compared to the terror that Jarl Harvey felt as he went ahead with what he had to do—as he fumblingly opened that box, then set it down, and began a slow circuit of the dark room, all alone, to find out its dimensions. To fumble at the coffin-like box, to touch the wires, and curse horribly under his breath because he could not be sure that what his stumps of hands told him was what his fingers would have told him if he had not lost them.

FINALLY, when sure—or as nearly sure as he could be, in the circumstances—that every possibility of error had been eradicated, he returned to the black box on the floor. He returned to it unerringly, as though he had been able to see it, which, perhaps, he did in the eyes of his soul. Or maybe he counted steps from it, and around it, and back again.

And while he worked, General Daryl Strang sat before his television panels, and watched the warplanes of the Yellow Girdle wheel about overhead. Watched planes of his own command fight to the death, and die, and fall

among the living, and slay them, too. And he saw, with a grim face, how few of the Yellow Girdle fell, because they were so much faster, so much better armed. If a Yellow Girdle plane's pilot even glanced at the pilot of an American plane, that pilot fell.

Bombs from heavy Yellow Girdle planes were dropped in spite of all the Americans could do, because the bombers had such impregnable escorts of light pursuit planes—that traveled, at a guess, four hundred miles an hour. Bombs burst in the midst of American soldiers, and left only great gaping holes in the mountainside. The mountains themselves trembled, and the roof of the catacombs swayed back and forth. The electric lights blurred, and threatened to go out.

Daryl Strang sent words of encouragement to his flyers.

Fight on. Reinforcements are coming. Plans are being made to help you!

Little could be done to help those aloft, but what did it matter that he told them anyhow, since they were doomed to die? Let them die in the belief that their cause, in spite of all, would emerge triumphant.

And to the thousands of soldiers in strongholds on the flanks and shoulders of the mountains, and down to the foothills—who must withstand the marching millions who were now so horribly close—Daryl Strang said: "Hold them until you die. And even as you die, fight on if you can."

A wild, foolish, impossible thing to do. But to youth all things were possible, and youth believed it, and youth tried to make it come true, because youth commanded it—and youth believed in Daryl Strang.

Somehow, anyhow, America must hold. If pushed back, she must fight for every precious inch of ground. To the teeming millions behind the Rockies he had but one command to give—which seemed hopeless, even to Strang as he

gave it. "Find shelter in the deepest caves, and stay there!"

For he knew, and they knew, that the deepest caves man could reach could be probed by the falling bombs of the enemy who had already dropped death and destruction on every city east of the Rockies. It was only a question of time. Strang knew, when the Yellow Girdle would use planes to drop soldiers through all the country east of the Rockies.

But until that time came——

He could only fight as best he knew. And he had, by now, forgotten the man without eyes, fingers, feet, tongue——

AND IN that dark room, with a kind of prayer on his lips, Jarl Harvey took what seemed to be a cube of metallic jelly that glowed with a strange, soft light. Deep in it, the image of a tiny human figure glowed more strongly. Gently he set it down. Fumbling, he pressed something in the box, and desperately calm, still half self-hypnotized, restored the glowing jelly.

Then, as one who waited in terror for some new, unnamable catastrophe, he backed against one wall of the room and listened. Listened to the whispering in the box. To the whispering and the soft crackle of varicolored flames he could not see—yet once had seen. Whispering—whispering, drawing together, coalescing, as currents played through the box and its assorted contents. Miracles gave birth to other miracles, and those who listened outside the door wondered if they were mad. A rustling vibration stirred and shifted in the assorted stuff in the coffinlike box, glowing in rays from the lens of the camera-thing.

They heard a lid move, they thought—perhaps the lid of the mysterious box. They heard a healthy, harsh voice snap: "What the hell is this, anyhow? Where am I? How did I get here?"

Eavesdroppers gulped and swallowed, hearing the voice from a room which a tongueless man had entered alone. And with it, as though in answer, a mewling sound, oddly like the sounds blind kittens made.

"What is that?" said the voice. "What's that whining? Who or what are you? What funny business is going on?"

Came the mewling sound again, causing eerie chills along the spines of the eavesdroppers, who, suddenly, were none too sure that the days of miracles were no more—that witchcraft was a fraud. Nor could they understand this voice's meaning any more than they could understand why there was a voice—where only the mewling sound made sense.

"Oh, I get it, finally," said the voice softly. "But what sort of dump is this, anyhow? It isn't the 'Frisco place, is it? Well, why don't you answer me? Get me out of here, can't you? Who's there, if anybody? Where are you?"

There was, for a little time longer, the voice, and the mewling sound, and there was beseeching, and pain, in the latter. Then the door opened and a man came into the light. The soldiers listening at the door gasped, and swore, and those who were Irish among them, and believed in the fey, crossed themselves.

IV.

For the man had blue eyes, and he had hands and feet. He had a tongue, and the gift of gab, obviously. He was garbed as a private citizen, even to the shoes.

But this was why the soldiers crossed themselves: The private citizen, aside from those differences, was the same wreck of a man who had gone into that room—and somehow performed a miracle on himself. And they'd have crossed themselves again, if the words of the

man had meant to them what it meant to the man who spoke them.

"What are you mugs staring at? I'm Jarl Harvey, and I've done one thing to prove myself. But I don't know where I am, nor how I—I happen to be here." His mouth smiled then, but his eyes were cold as he went on. "But I wouldn't, of course. Thirty seconds ago I wasn't a man—just meat and garbage and dirt, by the looks of things."

Naturally, they thought he was joking.

The newcomer who called himself Jarl Harvey carried the black box first brought by the eyeless one—who appeared to have vanished.

"Stay out of that room," said Jarl Harvey. "It still holds a secret that must be kept."

For a private citizen, he seemed bossy, and they were preparing to resent his orders—if he had come in a normal way.

"Take me to your chief chemist," he said, "or your scientific geniuses, or the general——"

"What you want to see, Harvey," said a corporal, "is the Chief Photographer. What's chemistry or ballistics or gas warfare to do with photography? That's a camera you got there, ain't it?"

"Yes, it is, in a way," said Jarl Harvey strangely. "And maybe I should see the head photographer. Though what I have in mind doesn't fit anything, really, that any of the people you've mentioned have anything to do with. What's happened, anyway?"

Obviously, there was no sense to it. Those who had seen Jarl Harvey go into the dark room alone—except for a box filled with a mad miscellany of food-stuffs and metal—and return to the mouth of the catacombs half an hour later—could make nothing of it. Still, in an army where everything was helter skelter, you were lucky if you knew your own name.

In the dark room the queer soft flames that ran through the coffinlike box, flared up once, furiously—as though all switches had been thrown in, to burn something in the flames. A queer, mewing sound, with pain in it, lasted for a few seconds. Then all was dark and silent, and the flames were gone into darkness.

And so, for a brief time, the dark room was lost to the mad sequence of events, and in the catacombs a renewed Jarl Harvey became a part of the army. He was a man with a purpose, and with a stubborn will—as befitted one who could walk miles on the stumps of feet, feeling his way because he had no eyes. He asked to be taken to the Chief Photographer, and there was something about him that made men jump, even men who were his seniors.

The Chief Photographer was a colonel. He looked up, after a time, as Jarl Harvey stood before his desk, slouching a little.

"Stand at attention!" snapped the colonel.

"Why?" said Harvey. "I'm a civilian. And who cares about standing at attention when a nation is in danger? If what they tell me is true— Here, take a look at this camera."

He placed the black box on the colonel's desk. The mountain shook as, half a mile overhead, the Yellow Girdle dropped a probing bomb. More bombs were dropping now, and the barrage had moved up the face of the mountain to the very feet of the catacombs.

Colonel Holcomb, Elias Holcomb, looked at the black box, pushed it away.

"That's no camera," he said. "What are you trying to pull on me, anyhow? And how did a civilian get into the stronghold? That box is—take it out of here, or I'll call the guard and have you thrown into the guardhouse."

"It seems," said Jarl Harvey softly,

"that General Daryl Strang, according to talk I've heard since I arrived, has demanded a miracle. I'm the miracle. The name is Jarl Harvey."

"Never heard of it! Where from?"

"Frisco!"

"And what do you wish of me?"

"Only that you keep quiet long enough to listen to me for five minutes, while I tell you, in strict confidence, about this camera which you say is not a camera."

"Ten thousand men will die in five minutes, Harvey!"

"Ten million will die, who might otherwise live, if you don't listen! And don't call me crazy until I've demonstrated what I have to say."

THE COLONEL sat back, putting his fingers together over his chest. Jarl Harvey began to explain the secrets of the black box. He hadn't spoken a hundred words before the colonel was leaning forward, as though to rise from his desk in fury. His face was a fiery red, his eyes shooting flames.

"I won't listen to such——"

"Shot up!" said Jarl Harvey tensely. "You're listening to the truth, which amazes you only because this particular truth is new to you. I swear to you that the camera will do exactly what I say it will, and that I'll prove it!"

"You're a blithering liar! You're a maniac and should be locked up!"

"But just suppose, colonel," Harvey interrupted softly, "that every word I said were true? Would you take me to the general, so that I could place the camera and its secrets at his disposal?"

"He'd place me under arrest as an idiot, for even listening to you."

"Not if you swore that you had witnessed a demonstration, colonel. Listen, play ball with me for a few hours and——"

"You're talking of men out of the Arabian Nights! Or men in nightmares. Of men who never were——"

"Nothing of the sort. I'm talking of

natural, normal men, that's all. And as for whether they have fathers or mothers, all I can say is this: the fathers and mothers they claim for their own would be the last to deny them!"

"But the man who came here, to the fortifications, whom you say had no eyes, no feet——"

"I am that man. My sweetheart operated the black box at my instruction, colonel. And when she did so, I had eyes, and fingers, and feet, and a tongue. That's why I——"

"It's absurd. But——oh, Lord, Harvey, if it were only true!"

"If it proves so, sir, how long would it take your men, with the aid of the chemical branch, to build an integrator——let us call it——capable of holding a battalion, or a regiment, or even a brigade?"

"That would be no miracle, Harvey. We can do that. Not easily, but we can do it. First, though, the proof."

"There is still something in the box in the dark room. Suppose you follow me, now! But first, ask your own personal orderly to stand still a moment, against the wall opposite you. He is your proof. It won't take a moment."

The orderly backed against the wall, his eyes popping. He didn't know what to expect. Jarl Harvey aimed the black box at him, apparently took his picture.

"My supplies are limited, colonel, to what I was able to bring with me in this apparatus. We'll need innumerable impression cubes."

"They're material, so we can make them. Give me one for our scientists to analyze——"

"I'll write down the formula for their making, colonel, to save time. All your men have to do is follow it carefully, and they must make no mistakes whatever, even to the millionth of an inch. Now, if you will go with me."

The colonel, his face white, his whole expression showing that he half believed he walked with a lunatic and didn't ex-

actly know what to do about it, started off with Jarl Harvey. His orderly fell in behind him. Jarl Harvey snapped at the sergeant.

"Better stay here, if you don't want to be scared out of a year's growth!"

V.

The sergeant looked angry, but the colonel, sighing to express his resignation, gestured for him to remain behind. Harvey and the colonel entered the dark room, where Harvey worked swiftly—as he could well do, because he had all his faculties. Two men, the colonel and Harvey, went into the dark room and locked the door.

Three men came out. The face of the colonel was dead white, his eyes rolling. Jarl Harvey was grinning, and his face was alight with triumph.

"Well, colonel?" said Harvey.

"I'm crazy, not you!" said the colonel. "But what do you want now?"

"Order your men to build, at top speed, the biggest integrator possible. Not in the stronghold—in some open place where the troops can be massed at one time under some sort of camouflage. I've no need to tell you that speed is everything."

Colonel Holcomb, choking, snapped commands at the third man, who faced left, smartly, and started for the colonel's office. Holcomb looked after him.

"He didn't ask a question, Harvey! He knows where to go!"

"Of course, colonel. He's your orderly. You selected him because he *did* know his way around."

"But not that—that— Oh, hell, what's the use? Now what do you want?"

"To go with you to General Strang, to see how things are going. Then, as soon as the gigantic integrator is ready, I'll tell you what we'll do next. Remember now, plenty of impression cubes,

made at top speed—a big integrator, close to some level place where a great number of troops can be mustered."

"All right, to the general first, but—don't say anything until—until——"

"Forget about it, colonel," said Harvey, grinning. "I don't want to be accused of being crazy any more than you do—nor of having delirium tremens!"

Side by side they strode to the main post of command. Colonel Holcomb, entering, asked that his assistant, Jarl Harvey, be allowed to stay close to him. General Strang stared at Harvey for a few seconds. There was a light of recognition in his eyes. Harvey looked back at him steadily, for Harvey did not know him at all, had never seen him. And Strang set the strange illusion that he had seen Harvey somewhere down to some vague resemblance. The eyeless one had all but passed from his memory.

For the Yellow Girdle was pounding at the very gates of the catacombs. Strang had ordered his flyers out of the air, rather than allow them to go to sure death. He had ordered civilians to the east to find what cover they could, and to pray. He was going to bet the life of the nation on his ability, in a series of mountain fortresses that engineers of yesterday had believed impregnable, to hold out for an indefinite period of time.

NOBODY noticed when a man in civilian clothes—Harvey—quietly took his place where he, too, could see what was going on. Strang was trying to watch everything at once, by television, and Harvey could have asked for nothing better. For thus, in a few minutes, he could see the disposition of government troops along the entire line—and, at almost the same time—how the enemy troops fared.

The catacombs were a vast, endless labyrinth, the solid rock of the mountain buttressed with reinforced concrete to a thickness of forty feet—streets of all kinds figured to the hairsbreadth,

and allowances made for every possible contingency, even to a sudden splurge of Nature's mountain building. Harvey knew, in a matter of seconds, that even if the mountains were blown to bits about the catacombs, the latter had a fair chance of surviving.

The world's most nearly perfect fortress—which was a series of fortresses, stronger even than the mountains in which they were built. Great shoulders of mountains reached out toward the enemy like the forepaws of monsters, and in each of them were extensions of the catacombs, garrisoned by crack troops. Because those troops, in the forefront, must bear the brunt of the main onslaught—the mopping up by the Yellow Girdle—Fillboxes. Redoubts. Emplacements for monster disappearing rifles. There wasn't, apparently, a foot of space all along the mountain range—or that part of the nation's backbone actually within the United States—that wasn't capable of spouting its bit of death and destruction. And every redoubt, every emplacement, every strongpoint, was in position to be covered by anywhere from three to four others. In other words, whoever attacked a given strongpoint must do so under the fire from three or four others. It didn't seem possible that human beings could even think of attacking such a place.

Yet there was proof enough, right at the base of the mountains, that the Yellow Girdle was doing it, knew what it was doing, and wasn't too greatly concerned about it. There was something so horribly fatalistic about the soldiers of the Yellow Girdle.

A hundred—a thousand Yellow Girdle bombers streaked across the mountaintops from north to south, back and forth from east to west, dropping bombs. One single bomb struck a great promontory of stone—and the promontory, like a house of cards, fell into dusty wreckage, and the mountain, for miles

in all directions, shook with the explosion.

And no sooner had the bomb executed this frightful havoc, killing everybody, naturally, who might have been inside that promontory, than guns from the coast bracketed the place, and probed in the mess for anything that might remain alive, for any man-made cavern under the ruins that might hold the breath of life for as many as one American soldier. So the bombs destroyed, and the projectiles from the coast probed through the debris left by the bombs. The projectiles stirred the carrion left by the bombs, to make sure that it *will* dead.

A whole mountain shoulder slid into a great canyon, so that where the shoulder had been, and the canyon had been, there was neither canyon nor shoulder, but a mass of stone, and dust—deeply piled over the dead.

The bombers were laying down their barrage, and the long range guns were laying down theirs. And far below the base of the mountain the soldiers of the Yellow Girdle were resting, waiting for their turn. And from every coign of vantage within range, Uncle Sam's soldiers poured big shells and little shells into the soldiers of the Yellow Girdle. Harvey saw them die by thousands, under that hail of metal. He saw survivors hunt for cover, saw the cover blasted into dust. The whole thing was as though the mountain itself were exploding, yet somehow remaining approximately whole.

Only once before in the history of these mountains, Harvey thought, awe-stricken beyond words, had anything approaching this vast acene transpired—and then, probably, no human eye had seen it. That had been when the mountains themselves had been built.

A barrage beyond conception. And then, after several hours, it stopped. It had been going when the first Jarl Harvey had reached the foothills. Only the

mass of the mountains, but scarcely any of the shape they had held when the barrage began, remained.

Daryl Strang straightened.

"The barrage is lifting," he said quietly. "Here they come! Our men are to fire at will until the enemy is actually upon them. Then they are to meet the Yellow Girdle in the open, with every weapon at their disposal."

THE GREAT yellow waves marched into an inferno of fire. The mountain spat bullets of every conceivable size straight into those tidal waves of humanity. It spat piercing slivers of lead and steel. It spat bullets that exploded on contact with even a vagrant breeze and, exploding, wrought havoc for many yards in all directions. A bullet went into a man, exploded, killing that man, erasing him—together with a dozen other men around him. Slaughter beyond words to express piled the soldiers of the Yellow Girdle up at the base of the Rockies, as the mountain erupted lead and steel.

The first wave was destroyed. The second, third, fourth and fifth waves. But behind them were yet other waves. And nothing could stay their march. Harvey looked at General Strang, to see the general's face streaked with pearls of sweat. Strang was saying, half to himself:

"It's actually like fighting locusts with fly-swatters. Kill a million of them, and two millions take their places. And just think, we're just a single phase of their attack! To the east their bombers are working on our civilian population, clear to the east coast. Their long range guns leap the mountain, hammer at our reserves. Every bullet we fire kills. Lord knows how many—yet when we look, after a minute or two of it, there are just as many as before, still advancing calmly, firing, advancing again. The only difference is that they stumble a

little, because it isn't easy to walk on a sea of dead bodies!"

Colonel Holcomb's eyes met those of Jarl Harvey, as two orderlies entered headquarters—two of Holcomb's orderlies, as like as peas in a pod. Two who ignored each other because their dignity, as orderlies, must not be violated by the curiosity which must have consumed them both. Neither understood the presence of the other, and it was, perhaps, just as well. Holcomb, hopeless, nodded to Jarl Harvey.

Harvey, unafraid of authority, darted to face Daryl Strang.

"One moment, general," he said. "Their numbers make it hopeless—unless we have numbers, too, equal to theirs—"

"Get away, whoever you are! You're talking absolute nonsense! They've got fifty millions—"

"We haven't, general," said Jarl Harvey earnestly, "but in a matter of minutes, we can recruit an extra man for every soldier and every officer who can be mustered in this sector. And all will be as well-traired as any you now have!"

"Take this man away. He's a maniac!"

"I'm the miracle, general!" said Jarl Harvey.

Daryl Strang stared, studied Jarl Harvey, said: "Now I know where I saw you before, only then you had no eyes, no fingers—"

"No feet, no tongue, sir," said Jarl Harvey. "Now I have everything, which in itself should make you wonder before kicking me out. Well, sir?"

"What's on your mind?"

"Mustering a regiment, two regiments, a brigade—instantly. If Colonel Holcomb—"

"Everything is ready, Harvey," choked Holcomb. "My orderly—orderlies—orderly just reported so. But one bomb, dropping into such a group of men—"

"We'll risk it," said Daryl Strang.

Outside, the general. Outside, his staff. Almost a full brigade mustered beside a pit filled with what looked like collections from countless dump heaps. But that must have some incomprehensible significance, because wires ran into it, and there was a way to cover it over and hide its mystery.

"Form them in lines of masses, sir," said Harvey. "I'll work fast. We must take a chance on a bomb."

In swift precision the group was massed. Jarl Harvey pointed the black box at the group silently. The men muttered. A hell of a time and place to take pictures! But Daryl Strang, whom they all recognized, looked grimly serious, so it must be no joke, must have a reason sufficiently strong to justify taking a chance on the lives of so many.

"I promised you one recruit for each man here, sir," said Harvey. "But I'll do better. I'll give you twenty for each man here!" under his breath he said to himself.

STRANG and his staff were looking up at the sky, their faces grim. For from several directions sounded the dull roaring of Yellow Girdle bombers, whose pilots could not possibly miss seeing a concentration of men like this.

"I'm finished with them, general," called Harvey.

A whistle sounded. The men dashed back to their posts, back under cover. Harvey moved to the chaotic pit. Holcomb's workers were there to help him. He carried a dozen or more half-inch cubes of strange metallic jelly in his hand, carefully, as though they were worth their weight in radium.

He worked a miracle with what looked so much like an all-purpose dumping pit—and with one of the tiny cubes, while Strang and his staff watched. The pit opened as he signaled Holcomb's men, and out of its surging mystery crawled and climbed—

That which almost brought screams

from the lips of Strang and his staff!

The pit closed again on another of the cubes—was opened a second time, and a single gasp welled up from the mouths of the officers. Bewildered, cursing, a battalion fought its way up and out of a shrunken mass of junk—

Jarl Harvey had proved his miracle by duplicating it!

"Well, general," he yelled, his voice high and cracking with excitement, "will you believe me now?"

He felt like a god—while Strang and his staff wondered if, after all, a god had not at last given them their miracle.

Strang said to Harvey: "I don't understand it, don't believe my eyes, but no general should ask for miracles, then refuse to believe them! Tell me, instantly, the secret of that box?"

Jarl Harvey wetted his lips, smiled, hesitated.

"Aladdin's lamp, sir, brought down to date, if you can do what I need. Say, if you like, that it contains the Dragon's Teeth that Jason forgot to sow. The ones he *did* sow, grew up and became warriors, remember? There's no time for more just now. But get this—this box holds defeat for all the countless millions of the Yellow Girdle!"

"Use up all your cubes, Harvey," said Strang in a choked voice. "Then return to headquarters as a member of my staff, with a major's commission, responsible to none but myself."

"And the box, sir?"

"I'll sacrifice an army, if need be, to keep it safe!"

VI.

"HARVEY," General Daryl Strang snapped, "I don't know how you did that. I don't even believe you did it. But, by Heaven, I saw it—my staff saw it—and if they can make the Yellow Girdle see the men, too, they'll do. Are they real—or figments of imagination? Is that some three-dimensional camera,

projecting its image as lifelike as its original—"

Jarl Harvey shook his head slowly. The television screens on the walls of the Headquarters room flickered and moved and writhed with flame and creeping, searing mists. Silent ghosts of giant bombers moved in unreality across their surfaces. Outside somewhere, the reality of seared, blasted flesh knew those things for an instant—then never knew again. "They aren't images," Harvey said. "They're real. As real," he smiled tauntly, "as I am. I'm one, you know. Jarl Harvey—I went into that dark room the broken thing you saw, General Strang. Eyeless—fingerless—broken. But you see—before the catastrophe, while San Francisco still was, and I—I had a family, my fiancée took my 'picture'—my image in one of those impression cubes. Jarl Harvey—that other 'I'—brought that cube with him in this analyzer. And from it, and the matter you had placed in the integrator booth, I was formed.

"I'm Jarl Harvey. I'm real. Only—as Colonel Holcomb said—I was never born. That's—silly though, because I remember my mother, my father—"

"No matter. I'm real—those troops we materialized are real. They're men, the same men who stood before the analyzer. You see, this mechanism is based on something new—unheard of before this day. I wanted television—a television that would need no sender, but only a receiver, yet could see through rock—steel—anything. See, and analyze the minerals and oil deposits beneath the surface.

"It was a good idea—and to an extent I made it work, when I realized what I must use. No light, no X-rays, can penetrate more than the surface. But some illuminant, sending back messages of what it strikes, must be used.

"There is one—one always present, day or night, and very deeply penetrant,

the most penetrant in the known universe. Cosmic rays. Rock—water—metal—nothing stops them quickly. But mineral deposits are so deeply buried—too deeply. The original impulses could enter in sufficient strength, but for reception they had then to plow their way out through that same vast mass of matter.

"It didn't work, but I did develop a 'film,' a something, to replace the sensitive plate of a camera—the first beginnings of my impression-cube.

"After that—there was an accident. I don't have the slightest idea why this thing works now; just know it does, and that I can make others like it work. In principle—it uses cosmic rays. It is a three-dimensional image formed by cosmic rays." The condensing lens is a field of force, built up by electric power, stabilized by a tiny battery current.

"The image it forms, though, records in utter, absolute detail the complete analysis, in three dimensions, of *every single, individual atom and molecule it strikes*. And further, by focusing the camera again on raw matter containing those same atoms in sufficient quantity, in any arrangement, it tends to force those other atoms into those same positions.

"A little chemical energy is needed—the electric current feed-wires supply that through the medium of the intense ionization that follows that ray.

"Atom for atom, molecule for molecule—an exact duplicate. General Strang, I promise you that I can give you a fully equipped army of a hundred—a thousand million men! For every man the Yellow Girdle destroys, we'll raise a hundred from dead matter. Every man the Yellow Girdle slays, we'll throw into that integrator, to bring him out again whole—alive. Their dead we'll use—to rise again and fight against them—as our men!

"Not men alone. Machines—tanks—guns—planes. Ammunition and poison

gas. This thing I hold is the mightiest production tool Man ever had. Production, they say, wins modern war; then, by all the Gods of War man ever dreamt of, we have the Yellow Girdle locked, defeated, destroyed in this black box!"

General Strang moved slowly. His staff about him looked on the miracle, and their eyes blazed with exultation—understanding—for they had to believe. From the chaos and muck of garbage and junk they'd draw forth an army! From crushed metal and broken tools, even from dead ore, they'd draw 16" guns and monster tanks. From a single captured Yellow Girdle plane they'd raise a stinging, screaming fleet of ten thousand planes—and every plane piloted by the best pilot in all the American forces! Every plane piloted by the same man!

And General Strang spoke, his voice full of a bitterness that scared his soul. "Wrong," he grated. "Wrong, damn you, Jarl Harvey. Those gods you called—those ancient Gods of War—are laughing at us. Oh, damn you, damn you, Harvey! We won't. We'll die here—die like the trapped rats we are, crawling in our holes as the Yellow Girdle plows us under.

"And you—with your fiendish torturing, blasting hope. You're fools, smirking at that insane thought! A hundred million men—"

"But it works——" Jarl Harvey stared at Strang with a blank, dazed face.

"It works, you fool, on matter! One hundred million men—and you said you needed 300 pounds of matter to make one man! A million men would mean 300,000,000 pounds of food, and metal, and other stuffs. And the Yellow Girdle would smash that million as easily as our first million was annihilated. We

haven't 150,000 tons of food. We haven't the transport to bring it. The Yellow Girdle has blasted the rail lines. Before we could assemble—anywhere—the fifteen billion tons of food you'd need for that army you talked of—the world would be overrun by the Yellow Girdle.

"Guns? We need the iron. And more, we need the chrome, the vanadium and molybdenum and tungsten we cannot get to make those. Planes? Where is the tungsten of the valves, the molybdenum and chrome and vanadium of the rods and cranks?

"You spoke exact truth. We have the mightiest production tool man ever dreamt of—and no raw material whatever! We have the greatest military weapon of Earth's history—and not the slightest use for it!"

Dazedly Jarl Harvey stared at the white, strained face of General Daryl Strang, the youngest general to ever command the army of the United States of America. Slowly the import of the thing came to him, and to those older staff men standing there. The greatest potential weapon of all time—useless. The vastest army ever dreamt of—unroused for want of matter.

Deep in the shell-blasted catacombs the ground rocked to the frightful havoc of the Yellow Girdle's shells. Deep in the catacombs lay the greatest tool Man had ever made—worthless. The Duplicator—the miracle for which a nation prayed—was impotent!

The mighty tread of the fifty millions stamped down the ground, from the sea to the vast ramparts of the Rockies. Slowly, their feet, shod with blasting shells, churned down the last resistance. Presently some seeking bomb would destroy forever the one thing that might—but for the lack of dead matter—have saved the nation——

Wings of the Storm

*An unusual tale of a curious little man—
who sought the Storm-Beast.*

by

Manly Wade Wellman

IF this were a tale of fantasy, it would begin by calling Eric Mogollon the foremost scientist of his day. The regrettable fact is that he was one of the most ordinary. His career was that of so many—an early determination to study medicine—an exhaustion of funds before graduation—a turn to teaching. For more than twenty-five years Mogollon taught elementary science, botany and biology in the public high school of Collison, Florida.

Least of all did he look distinguished. He was short—barely an inch over five feet—with narrow shoulders and a wide, sagging stomach, so that his torso resembled a pear. His gray locks straggled thinly; his gray moustache drooped luxuriantly. His wide blue eyes needed thick glasses. Clothes always seemed sloppy upon him, even when they had been pressed half an hour before. Only his slender, sure hands hinted that he might have been a successful surgeon—if he could have afforded the education.

ONE NIGHT IN early June he sat up late, grading examination papers. Mrs. Mogollon brought him a cup of strong coffee, and over it he tried to view brightly the twelfth dull paper. This student deserved no more than a C—maybe a C plus. Mogollon yawned over the first nine questions, then concentrated on the tenth.

He, Mogollon, had tried to be original in framing that question—had tried,

also, to evoke originality throughout the class. He had asked that each student comment briefly on the scientific fact that had most interested that student during the semester.

"Many scientists believe," began this answer. Ho hummm, like all the rest. Mogollon read on:

Many scientists believe that the smallest of the insects, such as the ants, are not aware of human beings near them. Human beings appear too big for ants to see or understand; they are like big shadows on the sky. When we step on an ant hill, it is like a hurricane to them, only harder for them to understand than for us to understand a hurricane.

A drab, repetitious recital of what Mogollon had once read aloud to the class, from the book of a great authority on the insect world. Mogollon took up his red pencil and wrote under the paragraph: "Do we understand hurricanes?" Then he folded the paper, marked it C plus, and added it to the pile. At once he forgot it.

But the next day he paused, by the merest chance, to look at a display in the window of a bookstore. A title caught his eye: "High Wind In Jamaica." It recalled to his mind the examination paper—the brief suggestion of ant-folk unaware beneath the vast, catastrophic feet of human monsters. He grinned briefly in his heavy moustache over the obvious progression of the idea; what did cause hurricanes,



The continent was small to his drug-brought giantism—yet the Storm-bringer loomed huge—

that scattered and smashed men and their works like ants and anthills? He must read up on the subject. A few minutes later, as he trudged on, he forgot once more.

A week later, two days after school had closed for the summer, a hurricane swept up through the West Indies,

skimmed the Gulfward coast of Florida, bobbed inland and took the roofs off of a hundred homes in Cullison, including the modest residence of Eric Mogollon. Reporters hurried from larger towns, taking pictures and interviewing everybody. A man from Jacksonville, learning that Mogollon was a teacher of sci-

ence, suggested that he write an article on hurricanes for the Sunday feature section of the Jacksonville paper.

Mogollon agreed. At the library, a squat building of limestone that had escaped serious damage, he called for books on meteorology. Here he learned that the rationalization of weather was an inexact science, for all its complications—that there was considerable argument over what stopped and started windstorms in and near the Gulf of Mexico. He wrote the newspaper article rather dully, but made much of the mystery of hurricanes, and on the end tagged a reverse view of the paragraph in the examination paper: "To harassed and helpless mankind, the impact of the hurricane is like a heavy, thoughtless boot scuffed through an unsuspecting hall of ants."

On Sunday morning he read his article, illustrated with pictures of the wrecked houses of Cullison and an old portrait of himself, taken fifteen years ago and representing him as looking almost interesting. He derived considerable satisfaction from the experience, and went for a walk. His way led him past a little church, half-stripped of tiles by the recent wind. Through its broken panes of colored glass came two lines of a hymn to an angry deity:

"His chariots of wrath the deep thunder-
clouds form,
And dark is His path on the wings of the
storm."

"The wings of the storm," Mogollon repeated aloud. And suddenly a vision came unexpectedly upon him. He saw, or fancied, great black pinions that stirred destruction down upon tiny ant-nests beneath. At that spot and in that minute of time was born the determination to do the unexampled thing he eventually did.

BEFORE HE HAD reached his home he had begun to consider the ap-

proach to the problem. An ordinary human being was plainly too small for sight or comprehension of what might ride behind the hurricane; therefore the ordinary human being must grow, in size and in power of vision. How? He had an answer for that, too. As a young man he had read H. G. Wells' novel, "Food of the Gods," in which giants were bred by a special diet. More recently he had delighted in the stories of Ray Cummings, who imagined and wrote of a drug that would increase or decrease size to an infinite degree.

"The fantasy of to-day is the fact of to-morrow," said Mogollon, without much originality, but with great determination. He went to work at once. An agent must be developed that would diffuse the molecules—like units of a vast army deploying over miles of territory.

Yet again the element of phenomenal luck enters the story of Eric Mogollon. Great scholars have tried and erred hundreds of times before they solved chemical riddles far less complicated than the one to which he addressed himself. That he, limited mentally and technically, should even attempt to make his fancy into fact is index of his impracticality. But, on his fourteenth attempt, in the little cellar room that he called his laboratory, Mogollon developed the principle that, after some rationalization and refinement, would serve his need. He achieved a surprising mixture. Combining it with water, he produced a whole sediment of gray and crystal bodies—animalcules increased to a size visible to the naked eye.

More experiments, with the mixture and with certain living organisms. Mogollon injected a droplet of his discovery into the viscera of a living pond-snail and watched it grow to the size of a derby hat. He prodded it and found it still alive but excessively flabby, like a jellyfish out of water. In time it shrank again; the growth phenomenon

was transient. He checked on other experiments, and had similar results.

The flabbiness of the snail fitted in with his original concept of molecule-ranks thinning and diffusing to fill a greater volume of space. Yet this open-order march of particles, with resultant fragility of body structure, did not persist in exact ratio with the growth. The increasing bulk, he judged, led to some extent on the air—on water vapor and carbon dioxide. His final conclusions were that one dose increased the treated organism to approximately sixty times its normal diameter, density of substance falling off considerably—he never computed exactly what the change was there—and the organism returned to its original size, density and general physical condition after rather more than an hour.

He began dealing with larger and more complex specimens, but a mole-cricket frightened him nearly into heart failure by growing to the size of a donkey. He locked it in a shed until it shrank back to its former comforting dimensions, and never experimented with any animal larger than a cockroach thereafter. He told nobody about his findings, not even Mrs. Mogollon. Her interests ran, in any case, to shopping and bridge and motion pictures, rather than to science.

ALONG toward the end of August, it was announced by government weather observers that a hurricane of exceptional force and danger was on its way out of the central south Atlantic, to lash the West Indies with its fury.

Mogollon had been reading about hurricanes, whenever he could find time between phases of his experiment. Most of the accounts were written by journalists, and abounded in colorful phrases. "Fiendish howl of the wind," "heavy tread of destruction," "towns crushed in a relentless grip"—bits like these consolidated in his fancy the image he

had built up. He became analytical. A storm area might spread for two hundred miles or so, but its center—the "eye" of the hurricane—generally measured about six miles across. A being with a base six miles in diameter would take considerable handling.

Yet he was ready. Weeks earlier, he had purchased an abandoned barn near the eastern coast of Florida, and there he had assembled rather more equipment and chemical supplies than he could well afford. Batch after batch of his mixture had he completed, for he needed hundredweights of it. Now that the hurricane was on the way, he informed his wife that he would be gone from home overnight. Driving swiftly in his little car, he reached the barn shortly before midnight on the twenty-eighth of August, with a clear sky and a half-moon overhead.

He parked his car at the side of the road and walked fully a mile up an ancient path to the barn. This was a bare, paint-flaked structure with pine trees at the north end. Opening the door, he peered in. There he made out the great mass of his preparation—white, cheesy, pungent to the smell. Once again he computed its volume; he needed a stack thirty feet in length, almost as wide and nearly two thirds as high, filling the barn to the peak of its roof.

Reaching in, he scooped up a double handful and moulded it into a ball the size of a grapefruit. From this he scraped a small dab and twiddled it between his finger tips until it made a grubby globe, rather smaller than a pea. Now for it—no, he must take off his clothes. They would split into rags upon his increasing body.

He lifted the spectacles from his nose, folded them and thrust them into a side pocket. Then he divested himself of his slouchy linen suit, his scuffed shoes and his long-sleeved underwear. Untidy as always, he kicked the garments under a low bush. Now he went to a

barrel of rain water at one corner of the barn. Next to this, full in the moonlight, he laid the six-inch ball of growth medicine.

He was ready at last. With a tin cup he dipped a drink from the barrel. Popping the smallest pill into his mouth, he took a quick swallow of the stale water to wash it down.

A DIZZINESS SMOTE him, and he could neither see nor hear. He felt a vibration, a humming, that may have sprung up either within or without his body. For a moment he almost collapsed, as though under a heavy weight, but he planted his feet stubbornly. After a seeming hour, things become more bearable. His head cleared, he could open his eyes and peer shortsightedly about. Now what?

Objects had grown small around him. He might have been standing on a model landscape, with hills diminished to bunkers, meadows to garden plots. A toy Noah's ark stood shin-high beside him in the dim moonlight. That would be the barn, of course. Those ferny things must be the pines that shadowed its north end. And a third of a city block away was the ribbon of road where his car was parked. All these things he observed with relish, while he thrilled to the thought that lay over them. His discovery was a success. It was proven on himself. He must be all of three hundred feet tall this instant! Oh, for a notebook and pencil, to jot down his findings and conclusions! But the notebook would have to be as large as a highway signboard—the pencil as long as a telegraph pole.

A sudden gust of wind, warm and strong, swept his face. A harbinger of the wind-monster that was floundering northward?

At the corner of the little barn stood the dun-colored thimble that must be the barrel of rain water. Mogollon knelt and concentrated his gaze. He spied the

tiny white pellet that lay there. It was no bigger to him now than the dose he had swallowed at the beginning of the adventure. He picked up the morsel between thumb and forefinger, and with his other hand lifted the barrel. It held hardly enough water to help the pill along.

He swallowed and drank.

Again the vibration, the dizziness, the blindness. Had Dr. Jekyll's brain and viscera been thus churned up when he became Mr. Hyde? Mogollon took time to remember—and the memory surprised him—that Dr. Jekyll was not a real person; he was fiction, the creation of Robert Louis Stevenson. Ah, Ray Cummings' stories were fiction as well, but here they were becoming a fact. Again clarity of brain, steadfastness of foothold. He chuckled over the joke he had made, wiped his face, and gazed around once more.

The field made a coarse checkerboard around him, and the ocean was barely his own length away. The barn had shrunk out of sight. It must be near his foot, somewhere in that bald patch. He bent and found it, with rather more difficulty than he had experienced in locating his second dose of growth-stuff. As a matter of fact, the barn was little more than pill-size now. He pinched it up and extracted its store of chemical. He turned toward the sea, stepped to its brink, then waded in. Ankle deep it was, and though he waded on and on, it remained ankle deep for a dozen steps. How could that be? This was the Atlantic Ocean. But he was so huge. What was sixty times three hundred feet?

Mogollon did the bit of arithmetic in his head, divided it by five thousand, and told himself that he must be more than three miles high. Summer warmth played around his legs and knees, but the wind blew chill on his jowls. No wonder—he was up there in the altitudes where aviators needed fur-

rimmed goggles. Now he was finding some depth in his wading, he had gained a point well off-shore and thigh-deep in the ocean. He lifted the third dose to his lips. With a quick effort, he swallowed it dry.

Even as he did so—and the unslaked pall was knobby in his throat—he braced himself for the unpleasant spell of dizziness. But this time it did not come. On prudent impulse, he waded a little farther out to open water and paused. The ocean receded rapidly down his calves. Other things began to pucker and draw in upon him, as though a shrinking agent had been spread around the spot where he stood. Once he looked upward at the sky, and felt astonishment to find that the constellations had not diminished. They were as spacious as ever, and the moon the same silver slice, clearer and brighter if anything. He paused at last. All was steady, inside and out. His third increase in size was plainly at an end.

ONCE AGAIN he multiplied figures in his head. Three miles—or rather more—times sixty. He must be two hundred miles high—or even higher. The Atlantic Ocean rose instep-deep upon him, a lukewarm dampness underfoot. Meanwhile, his mouth and nose must be completely out of the atmosphere as human science knew of it. At two hundred miles altitude there would be only light outer wreaths of hydrogen and helium. Yet he was not suffocating—he was not even breathing so far as he could tell. The change had taken care of that matter—perhaps by the absorption of air and water vapor.

He gazed down at himself, and saw his naked body as it had always been, but misty, as though glimpsed through a light cloud of smoke. His hand, for instance, was recognizable in every crook and knob—but its nails had no clarity of outline. When he touched his face, the tag of moustache felt arti-

ficial and amorphous, like a single piece of fabric instead of a close-grown strip of separate hairs. Lifting an arm upward, Mogollon felt sure that he saw the moonlight filtering through it, as though through amber or wax. His substance held its original shape, but not its original solidity. Perhaps, to the tiny eyes of whatever human beings looked upward to-night, he was transparent, a semidiscernible haze. Not once but thrice had his molecules deployed themselves under stimulus of the chemical, with only partial re-enforcements from the elements of the surrounding atmosphere. He would have to make full notes on all these things later on.

He let his eyes roam away from himself. He stood, it appeared, on a round hilltop, with sky on every hand. This was a vast section of Earth, he realized—after all, Earth's diameter would be only forty times his present height. The ratio would be that of an apple to the fly walking upon its rim. Within three or four paces lay the Florida peninsula, like the silhouette of a turtle's beaked head increased to the size of a hallway rug. He could step across it at its narrowest, he judged, and traverse it from north to south in about three skipping strides. Above and beyond, the continent stretched darkly, as big to him as a fairly extensive lawn. On its far side he made out a silver gleam that must be the Pacific Ocean. And behind him would be Europe—Africa—two door-yards. But he had not swelled to this unspeakable size for the sake of ogling far continents. There was something he had sworn to meet and eliminate, like a thorn from the tortured flank of the world. The hurricane.

His eyes travelled below the break-tip of Florida. There was Cuba—there was Santo Domingo—there Porto Rico. As a boy he had thought of Cuba as a hurrying dachshund, intent on overtaking the cat Santo Domingo, which in turn pursued the mouse Porto Rico. They

had looked like that in his fourth-grade geography. Below the parade of these larger islands scattered the smaller ones, clinkery dots and lumps in the moon-bright sea. Beyond would be South America—but he could not make out the coast line. What hovered between him and South America?

Mogollon's first sensation was of looking an elephant in the face. There was a gray expanse that might have been the front of a smooth skull, with an earlike flap stirring gently to either side and a trailing proboscis at the bottom. Patently it was three-dimensional, and patently it was alive. Its bulk was as great as his own or even greater and—relatively speaking—it was as close as though on the opposite side of a wideish street. Mogollon narrowed his faulty eyes for a better view, and made out that the head had no body, was in fact a body in itself. What he had seen as ears were wings, or served as such. Wings of the storm—the hymn had been right about it! And the trunk was rather a neck or throat, as thick at the base as his calf and rather smaller at the tip than his wrist.

That tip, he saw, extended to the surface of the ocean, and quested slowly but deftly here and there. Ripples ringed it about, and Mogollon thought that a little black island quivered beneath its touch.

Meanwhile, the entity was drifting ever so slowly toward him, toward Florida. In his slow, mock-methodical way, he realized that the cruise of his luck was running dry at last. For he had made this excursion into gianthood, thinking to trap an impish thing a bare six inches across—a crab or a toad in comparison to his stature. He would have seized it, examined it, and finally crushed it. But he had guessed wrongly. Six miles was not its greatest diameter, but its smallest—the width of the tip of its nose, so to speak. And it was coming closer, slowly but surely.

Mogollon told himself ruefully that he was in a most awkward position.

THE MONSTER was predatory, vicious. It moved slowly only because it was feeding—grazing sheeplike over rich pastures. It did not exactly devour small, solid things, but the essence of their agony fed it in some way. As for himself, he was large but of attenuated tissue. It might—nay, it surely would—be able to clutch and tear him.

Were there other things? No, he saw none. Earth could hardly support more than one such titan, to browse upon its lesser lives as an anteater licks up nations of insects. This storm-being must have existed since the beginning, floating cloudlike from shore to shore, putting down a hungry mouth on occasion.

And he, Mogollon, was not really a heroic monster. Comparatively, he was what he had always been—a soft-bodied, oldish man with bad eyes. Too, he was naked and unarmed.

If he had thought to provide himself with a knife—but that would have been impossible. An inch had become three miles to his present standard and viewpoint. He would have needed a wedge of iron eighteen miles long and three miles wide at the base—a thousand feet would have been none too great a thickness for it. What mine might furnish the metal? What smith forge it? On what stone could it have been whetted to an edge?

The floating body was nuzzling closer, in the direction of Porto Rico.

Now or never, said Mogollon within himself, and the silent cry of determination gave him strength. He made half a dozen quick, clumsy steps forward, feeling unthinkably light and inadequate. The down-drooped gray neck curved upward and forward, showing a dark maw-opening that turned toward him. Had the being some sort of eyes—could it see him?

Mogollon glanced down to make sure

that his great feet would not spurn the tiny islands he was defending. Then he sprang in, a very nervous tackle after a very frightening halfback. His arms tightened around a smooth, elastic-skinned bladder, and his nostrils were smitten with an odor sharp and osony.

Next instant he had swerved and sprung to his left—far westward—dragging with him the overbalanced creature. They fell with a gentle spatter into salt water a finger-joint deep. The wing-flukes beat at him, striking sparks into his eyes, but he did not let go. Instead he somersaulted with his captive, made shift to gain his feet beyond, and went down once more. The grapple began in deadly earnest, in an islandless stretch of warmish water. They must have been at or below the Equator.

The first charge and clutch had given Mogollon some advantage, but he did not know how to follow it up. The monstrosity, on the other hand, had sense and science about it. Still striking and lashing with its wings, it staggered him as a hawk might have staggered with wing-buffets an attacking weasel. A moment later its necklike member began to belabor Mogollon's head, bruisingly and cunningly. There were no visible eyes or eyelike organs, yet the creature assuredly possessed an awareness of how and where to strike telling blows.

Mogollon let go with one arm, doubled his fist and drew it back to strike. Before he launched the stroke, however, his prisoner spun out of his loosened embrace and away. It fell back a short distance, then began to circle him watchfully, as a wasp circles a spider.

HE WAS shaken and weary with his brief but violent exertions. He had no sensation of being winded, or panting—that was proof enough that he did not breathe as do normal human beings—but his muscles trembled and sagged. As the fluttering enemy closed menac-

ingly in, he struck awkwardly with both hands, missed, and clutched once more. Again he locked arms around the straining body and dragged it down with him.

His first effort was to straddle the thing and pin the thrashing wing-flukes with his knees. The bulk of it was too great, but he managed to keep on top. With one hand he seized the neck, blocking its flaillike assant, but he was not strong enough to hold back the tip from curving in toward him. The queening dark maw touched his shoulder, fastened there. He felt pain. The tissue of the creature's neck grew tense and then vibrant within his encircling fingers. It was sucking at him.

He tried to pull away, but could not. He had a sensation of growing weaker, flabbier, wearier. At the same time his adversary was plainly increasing in size, as though it were capturing strength from him. Something began to shimmer before him. Was he going to faint? Or was it that a rhythmic beat had sprung up in the body he wrestled, a throbbing rise and fall just at the base of the neck?

The thirsty hold on his shoulder grew tighter, more painful. And the thing became larger, larger—no, it was he who dwindled! His trebled giantism was fading from him sooner than he thought. Perhaps the wound was letting the force of the drug leak out. He could barely encircle the bladder-body now, even with both arms. He must hold on somehow, crush and conquer—

A wave of inspiration swept through him. He had forgotten an ancient weapon—a terrible one. Teeth. His teeth were splendid—the dentist had complimented him only last January.

Mogollon thrust his face down at an angle, pressed it right against where the beating stirred the storm-thing's neckline. He opened his mouth to its widest and bit.

For a breath's space the tight integument resisted—then his teeth set into

something pulpy and ammonia-tasting. He flexed the sinews of his jaws and brought those teeth together. A desperate shudder ran through every atom of the creature, and he felt himself tossed clear, sprawling full length in water deeper than he had expected to find. He got to his hands and knees, dashed spray from his eyes, spat and stared.

THE STORM-BRINGER was dying. It was immense now, as big as an elephant—a house—a church. But, as it grew before his peering old eyes, it lost shape. Its substance crumbled, like wet sugar. A gap widened darkly where he had bitten home. Something was giving way there, something that had held the powerful mass together and made it live. Now it was like the mist he had first thought it to be—but breaking up, giving off little swirls and rags. And the water, meanwhile, was knee-deep to him. Deeper. He was growing smaller by the second.

I have won, he told himself. His eyes, for all they ached for the want of spectacles, glittered triumphantly as they watched the death agony of the enemy. Already it could not be called solid. It was dissolving. The stars shone through it—the moon could be seen, a sharp half-disk.

The old dizziness possessed him utterly, and weakness more than he had known. He lost his sense of time and place, he pitched down and down, like a stunned bird in a chimney. Salt water splashed into his nose and mouth. Desperately he began to swim in it. Swam in a moon-spattered ocean, with waves breaking over him. He could see again, understand again. He was himself, a naked mote of life only five feet tall—only sixty inches. And this was the South Atlantic, miles deep and shoreless.

A shadow hovered near by. It fell upon him, shutting away the moon. A wing of his enemy?—but those wings were vanished. This silhouette had a

bow—a deck-line and smoke-stacks.

"Ship ahoy!" he yelled, in a voice that surprised him.

Silence, then an answering call—a surprised voice with an accent. A shouted order; engines backed water and fell silent. More voices, excited. Finally: "Ahoy yourself, in the water! Give us a hail again!"

When he had done so, there came back, "Can you keep afloat?"

"For a while." Mogollon made shift to wheeze out.

"Chin up, then. We're lowering a boat."

IT WAS IN the cabin that Mogollon saw and heard and thought clearly. The ship's doctor was kind and efficient; he, Mogollon, who had once thought to be a doctor, envied that efficiency. Finally the face above him ventured a comforting wink.

"You'll pull through, I daresay. That wound on your shoulder——"

"Yes?" prompted Mogollon excitedly.

"Oh, it's only a fishbite or something of the kind." Never mind looking, I've dressed it. Circular slash, two inches across. It ought to heal quickly."

"What ship is this?" asked Mogollon.

"The freighter *Fernando Po*, from Benguela for Rio de Janeiro. This storm that came up so quickly and went away all at once—it almost did us in. I suppose you were wrecked by it?"

"Yes," said Mogollon, "I was wrecked by it."

The doctor pursed his lips. "Odd thing," he went on. "Just before the storm struck us, the radio man had news of a bad hurricane in the West Indies."

Mogollon was feeling stronger—strong enough to have a joke all to himself.

"It's possible," he murmured, "that there won't be any more hurricanes in the West Indies."

Then he smiled in a way the doctor liked, but did not understand.



That ancient, but yet-to-be written document—it was mad—but it was right! The jet failed—now he faced Bars with a rising madness—hate in his mind—the blast gun in his hand.

A short novel, by a new Author,

John Victor Peterson

tells of death and mad confusion of mind because of time-travel—

Martyrs Don't Mind Dying

DEATH and mystery forever attend the triumphs of science. The conquest of time had its own list of martyrs which began properly on a certain spring day in the year

2011 A. D. and which emblazoned—in letters of blood—a grim mystery on the secret scroll of science.

Paul Duhamel's completed time-machine stood based on unstratified bed-

rock in the Canyon of the Yellowstone—

Iconoscopes caught the momentous scene, translating it, under the stimulation of swinging cathode ray beams, into electrical impulses, which, reaching the electromagnets of kinescopes in millions of homes, came into clear reproduction before eagerly watching families—

A flat expanse of weathered rock, thronged with craning, pushing thousands—backed by stratified, multi-colored cliffs—water splashing in rainbow mists to the side—the mid-afternoon sun coruscating in the myriad mirrors which covered Duhamel's strange helix, beating on the dark selenium cells of the solar-conversion machines which had charged its batteries.

The thrill-seeking world saw the little, middle-aged physicist brush the raven-black hair back from his broad forehead, saw him wave and smile as he made final adjustments, seated there within that insubstantial maze. Then there came weird, wavering evanescence which merged into crystal-clear air, the slightly-audible inward wash of wind and nothingness save a soundless expanse of naked rock—

Whispers that grew into incredulous debate. Announcers excitedly telecasting individual opinions, beseeching policemen to keep bystanders away from the video's lenses. Eyes strained at that suddenly spine-tingling nothingness—

A scribe slipped within the roped area and strode confidently toward the zone of nothingness, certain that Duhamel was playing a parlor trick with a "cabinet of invisibility." His face darkened in chagrin as he found—nothing!

Time argued on. The crowd grew restless and gyrotomicked thence. The world's televisions twisted over to a "canned" version of a struggling motion-picture industry's latest triumph, or to a sidewalk spelling bee on the fourth

ramp at Times Square. The age-old canyon was deserted.

Days passed, weeks, months. The raven-haired scientist did not return—

Physicists rechecked Duhamel's equations and duplicated his helix. Soon they became martyrs—although not all so cleanly as Paul. Smilingly he had dimmed and vanished. Horribly these others died as they tested their respective helices—two from burns, two from electrocution, and Lowndi—

No one knew what happened to Dennis Lowndi. His sister had found a disinherited pair of legs lying brokenly in the helix he'd made. On the bucket seat close above was a wavy-haired scalp clinging rather distractedly to a spongy, bloody mass of brains. Ironically, the helix was intact—

Some one smuggled a portable iconoscope camera into Lowndi's laboratory and cut the scene into the National Television Circuit. Imagine that vividly nauseating horror slicing into the polished, soul-soothing beauty of a symphony concert! The world shuddered and quickly tuned out—

Duhamel's theories, plans, equations, helix—all were outlawed from research. Possession of them was criminal. To the world the question of time-travel was a book closed forever to posterity. But—

I.

ON THE BANKS of the Big Horn River near Worland, Wyoming, a slim, black-haired girl took up the forbidden torch, rebuilding, rewiring the helix in which the latest Martyr had died. Deep in her lonely heart she had sworn to succeed where all others had failed. She must! Her name was Bara Lowndi!

Sheer faith drove her—faith in the theories and equations of Duhamel under whom both she and Dennis, her brother, had studied. But it is hard to carry a torch when the whole world has

lost faith in your cause, even the one you love.

She had tried hard to convince Russ Belding that she had discovered and corrected the infinitesimal mistake in the wiring which had sent a lethal disinterray to destroy her brother's splendid young body. But after they had finished dining in a tiny alcove just off the laboratory, he was still skeptical.

"Kid, it's madness!" he stated positively—stubbornly, she thought. "They've all died, even Den. You say Duhamel was time-cast. People say it did look so—it happened when I was down in Yucatan with the Saretzki Expedition so I don't know. If the truth be known, he was probably just painfully disintegrated, helix and all. Heaven knows a person can easily disappear nowadays without being time- or dimension-cast. Especially playin' around with every ray in the system plus a few deadly by-products. Time's not meant to be conquered—at least, not in that thing!"

"That 'thing' will conquer time, Russ!" she pleaded earnestly. "Ask any physicist to check those equations and—"

"Every physicist who checked them and followed Duhamel's plans simply committed suicide! The prof was just an eccentric dabbler anyway, prematurely in his second childhood—all freak X plus Y's and pipe-dreams from what I hear!"

"If you had ever seen him or heard him speak you'd have believed, too—you'd know time can be conquered! Whoever blueprinted Paul's plans erred slightly—the wiring was a trifle askew. It—it took Den's death to prove that! I think I've overcome it—"

"You *think*! Bara, don't be a fool! You can't just *think*—you've got to *know*! You can't kill yourself just because some harebrained prof tangled up with Einstein's theories of al., and came out second best!"

"There'd be no science if we didn't experiment, if we didn't take chances!"

"There'd be no List of Martyrs either!" he snapped. "Oh, kid, you've got to think it over—"

He grasped her hand possessively, but she shook it free, rose from the table, gracefully entered the lab and slipped into the Duhamel helix.

"Bara!" he exclaimed, stepping quickly to the glistening chrome gateway which had closed behind her.

"To-morrow afternoon I time-cast!" she declared abruptly.

"You can't! Kid, I love you—doesn't that mean anything any more? You've got to give it up!"

"I'm sorry, Russ, but I can't. It's my duty!"

"Your duty!" He laughed cynically. "To whom? Science? Be a guinea pig in Duhamel's Incinerator just to have your name stuck up behind your brother's on the List? Bara Lowndi, deceased; *requiescat in pace*? Kid, Den wouldn't want you to—"

"I'm sorry," she repeated. "I promised Dennis that I'd carry on if anything happened—" Her voice trailed off and a lonely tear fell to splash soundlessly on the instruments. Mechanically she smudged it away.

AND RUSS BELDING stood there, silent and grim, and wondered what he should do. For there was pain in his heart to see her following a will-o'-the-wisp which led only to death. Which made her oblivious to the love which he had confessed for her. Bara was determined, stubborn—sometimes almost cruel—but he loved her despite all that.

The televisionphone's bell cut the silence. Russ snapped on the transmitting and receiving audios and videos and said, "Russ Belding speaking—"

"Winslow!" the receiver boomed. "I've found—"

"Say, what ails your video? There's no image!"

"Electromagnet's out of kilter somehow—never mind that! I've found a metal cylinder buried amid those trilobite fossils down in the creek bed—and—I'm afraid it's——"

"What! A metal cylinder! Why, those strata are at least 500 million years old! It's unbelievable! But, Winslow, there's nothing to be afraid of; anything that old couldn't be especially lethal!" And, aside to Bara, he grunted, "Mental case—monophobia—'fraid to be alone, the willied whiteider!"

"Listen, Russell," the strained voice insisted, "I tried the Dyman blaster on it and uncovered a portion——" The voice faltered, then continued softly: "It's *durite*——"

"*Durite*? Why—Paul Duhamel's jumping-off place was only a half-mile up the Canyon! Maybe—— Hold everything; I'll be there in a half hour. Strong!"

"And hurry, Russell!" There was a strange, frightened urgency in the tired voice.

Bara was suddenly at Russ' side; her face pale.

"Who was that?"

"Just my assistant, Winslow; nothing to get excited over. He's a white-haired old man, small, wrinkled and endowed with a perpetual case of ye jitters.

"In addition, he's the smartest man I've ever known—knows all the -istries, -ologies and -isms and all the answers. But he's afraid of his own shadow. A strange fellow, but I couldn't get along without him. Sometimes he cries out in his sleep, usually just one phrase over and over, 'Oh, Lord, is he coming back?' and, always, the day after, he watches me and fear is written all over him. Gives me the willies sometimes myself, but, as I said, he's indispensable!"

"Where'd you get him?" Bara was in one of her inexplicable questioning moods now.

"Must a woman know *tout* or do the

French say 'touts' now? He popped up in Park City a few weeks ago and asked me for a job. 'Sa shame—he knows more about geology and paleontology than the Academy of Sciences and is quite satisfied to be my assistant!"

But she was standing there, half in a trance, as though she weren't listening, as though she were miles and years away.

"Aho, below there! Haven't we met somewheres before?" he asked, tilting her chin up slightly.

"Russ, this is more serious than you think! Paul was——"

"Tak, tak!" he grinned. "Skipper, darling! I'll phone and tell y'all about it and, hon, you won't go to-morrow, huh?"

"Not until I see 'whatsit' this 'whatsit' is!" The smile that supplanted the tired determination on her sweet face made her all the more adorable. Russ bent to kiss her, and something in the warm brown eyes told him that she would never leave him.

A strange look came over her face as she stood framed in the laboratory door, watching him expertly blast the gyrotomic away toward the west.

"Jitters or monomania or no," she murmured softly, a flood of baffling thoughts knitting her blanched brow, "*that was the voice of Paul Duhamel!*"

II.

DUSK was dipping wispy curtains of night into the Canyon of the Yellowstone when Russ Belding flared down on his underjets, slipped from the stubby ship and hastened down to where the old man stood, a radium-torch in one hand starkly illuminating a wide pit in the aqueous rocks near him, a Bates disrupter under his arm.

"Smatter? Keeping off poachers?" Russ asked, rather cruelly.

"It's something you may some day understand—God forbid!"

Russ dismissed it all with a shrug and stepped to the pit's edge. His keen eyes took the strange formation in at a glance.

Fossilized trilobites etched into the soft aqueous rock—magnificent three-foot specimens of Earth's early life-forms, a crawling, rolling arthropod—lying about, under, and partially over a lichen- and crystal-incrusted object perhaps a foot long and five inches in diameter. One end had been bared and glistened with the blue-green luster of the master metal, durite!

"Durite," he murmured, "a substance created by man—just two years ago, by Duhamel—found, in strata which knew neither vertebrate animals, insects, or plants—a sea-ruled age bearing a creation of man!"

Unmindful of the soft fossils, he leaped down into the pit, squashing the external cartilaginous framework into a condition which would have driven an Institute geologist into delirium tremens.

Winslow efficiently handed him a portable Duman blaster which he instantly flicked on. The incrustated find was bathed in lambent flame and was swished almost instantaneously clean by a flame approximating 4000° C. (the melting point of the quite unaffected durite approximates 5400°, an all-time high for any known substance).

Cooling the cylinder, Russ picked it up and started toward the dusk-shrouded wharf laboratory which clung amidst the weathered rock, slightly up the cliffside. The little old man followed him, his face frightened, eyes alert.

They entered the laboratory and Russ deposited the cylinder on a desk, sat down and studied it carefully.

Prominent on one end was a dial combination, its characters still sharply defined. In minute script on its center was: Planchon Locks, 2X11.

"That's a lock of last year's model!" Winslow's soft voice died away.

"The devil you say!"

"2X11 means 2011, Russell——"

There was a trace of madness in Russ Belding's eyes.

"Do you realize what this means? Paul Duhamel was time-cast—this must be part of his helix, for all the other Martyrs died. I must call Bara and tell her she is right—— But say! Who knows but this might be from *her* helix which hasn't even time-cast yet!"

"What!" burst Winslow in a sudden transition from his usual, frightened, taciturn manner. "Is Bara working on her brother's helix? Oh, the little fool—she mustn't——"

"Mustn't what?" Russ spun away from the televisorphone, amazed at the outburst.

"Mustn't—time-cast!" the old man said hesitantly, his voice calmer now. "If you love her, she can't go to—shall we say, death—and leave you!"

RUSS looked at him strangely. Was it imagination, or had it seemed for a moment that Winslow had meant something far different, something spine-chilling and horrible? Had there been something in his tone which might link up with soul-wrenched, fear-drenched cries in the night, "Oh, Lord, is he coming back——"

With a slight shudder of mingled pity and something akin to fear, Russ turned again to an irresponsible T V P.

"Short circuit, I guess—first the video went out, now the audio," Winslow murmured.

Belding's supple hands fondled the cylinder, idly spun the uncorroded dial-lock. His feverish eyes seemed to quest whatever time-warped secret lay within.

"There must be a way to open it," he mused. "I don't want to chase over to Worland again to-night on the slim chance that it might be——"

He paused. Amazement was mirrored on his face—amazement and pure horror at sudden, alien knowledge. For, touching the cylinder and wondering

how he could open it, *the combination had leaped instantaneously into his brain!*

"Winslow," he cried, "I know the combination! How? How? Can it be a telepathic message across the ages? From whom—and why?"

"Perhaps you'd best not open it. It is but a prelude to death——"

"Nonsense!" Russ said, but the inexplicable phrase brought a premonitory chill upon him. What strangeness this, to be telepathed across unknown millions of evolving years! His hand trembled as it turned the combination and opened the circular door. He hesitated, glimpsing a crumpled sheaf of papers within.

"A message," he half-whispered, "from a time when man did not exist——" His hand, trembling, drew out those mystic sheets. He mustered vaguely, staring at them, stained with the reddish-black hue of dried blood. He looked at the blurred penciling; his eyes went wide and he gasped.

"Good Lord, am I screwy or is——" Closing his eyes, he shook his head as though to dispel a vision. "Is that——"

"It is your handwriting, Russell!" Winslow was tense, wide-eyed, leaning over his shoulder.

Russ was staring at the writing incredulously. He hadn't noted the strange emphasis, the strange look of fear on the other's face——

"No, no!" he muttered, "it can't be!" And he laughed nervously, holding the papers in clenched hands, surveying them in an ecstasy of confusion.

"Winslow," he said thickly, "it's something——something born out of hell itself!"

His eyes were racing over that crawled writing. Words and phrases burned themselves into his brain. "I, Russell Belding—writing this in the last hours of life—here in this primitive waste with a dead man grinning at me—— That cylinder out of time started it——started to drive me mad with

knowledge of my own future. All night long after it came I dreamed dreams of madness. . . . But days ago—or was it a million, million years?—I flew from the Yellowstone and a jet—number 5 jet—blasted even as the papers said or say, for these are those and—Oh, Lord, it's mad, I know, and yet it is!"

HE RAISED his head and laughed rather shakily. "Winslow, it's impossible, utterly impossible. This tells of our finding it and yet it is an entity and cannot tell of itself!"

"Time and space are strange Frankenstein-children when foolish man meddles with them and thinks he is a god to change them as he will!" Winslow had dropped back into a chair, was lying with eyes closed, his lined face twisted crookedly.

"I suppose that's here, too!" Russ' voice had lost its usual calm. He rested a moment, waited for the blood to stop its strange, savage pounding in his temples. He shut his eyes, but somehow he could see that page stereotyped in his brain—every line, every word emblazoned there. He dropped his head again to read.

Flaming words blurred with blood. "Bara drove me to madness—lust to kill—drew gun, shot her between the eyes—helix—into time, fifty million mad years of backward-hurling life—a flash in eternity and then the helix stopped, batteries depleted. Wandering, wandering along the stony, lifeless shores, menaced by intertidal muds sweeping and sloshing on the sandy strand. Digging for mollusks, crustaceans and brachiopods along the verge of shallow, humid seas from which only the up-building axis of the Rockies reared their heads——"

"And then, one day, a man—a dark-bearded, jaded man tottering through the petrifying sediment geologists call the Waucoban rocks. Paul Duhamel! More insane than the whole mad world

whence I came—quarrels—wandering—

At length he raised haggard, blood-shot, incredulous eyes from that last scrawled page stained with blood—the page which said briefly, damnably: "An hour ago I smashed Duhamel's skull with a container from Bara's belix which a perverse destiny prompted me to carry. But he shot me with an explo-pellet—the one with which I killed Bara—got my right lung. I guess. Coughing up blood some—getting weak, can't write more— Damn you, Duhamel, you grinning, grinning fool. Your skull crushed easy, like a blown-up paper bag—funny!

"Can't write more—must lock this in container—strength about gone—Some day some one may find this who will understand— May Heaven forgive me for what I have done."

Russ' head was a maelstrom of conflicting emotions. His vision was blurred, his words incoherent.

"My future in past—life—death! That's my blood—mine! But I can't live it, Winslow! I can't, and yet, somehow, I *have*! It's my writing—my blood!"

Winslow was thoughtfully handing him a glass of whisky but he waved it away. His head was aching with a million throbbing pains and of a sudden he wanted only to sleep and forget it all.

"Give me a sedative—something potent!"

When he had drunk it he walked into his room and threw himself, fully clad, on the bed. He felt himself sinking into oblivion, nightmare slumber and distorted dreams that opened hideous, bottomless abysses dripping with gore and blood—the rich, red blood of Bara Lowndi streaming from a ghastly wound in her skull—his own blood spurting from his shattered side, filling his lungs, choking him. And all the while he was falling, falling—into pools of blood that engulfed him and spewed

him forth again and again. And before him Bara was dying and crying out to him and he could not reach her or aid her—

And out in the dim laboratory the little old man sat through all the night, reading and rereading the bloodstained pages, his brow twisted in wonderment, the Bates disrupter ever near his hand, fear in his puzzled eyes and oftentimes he murmured, "*Must it always be like this—throughout eternity!*"

III.

A MAD MORNING broke. Russ Belding swam into consciousness through a clotted veil of blood which clung reluctantly and ebbed back into the mad nothingness from which it had sprung. Preternatural memories were in his mind—*memories* of something that *was yet to be!*

He lay quiescent and tried to reason it out with the cold, practical reasoning of a born scientist. But it was impossible. Somehow he knew that his path of life was written in the damning lines which haunted him. He *knew* it!

A sudden desire for death swept over him—the easiest line of resistance for him to whom the future can mean only the inexorable completion of a malign destiny. He drew an explo-pellet from his belt, raised it to his throbbing temple but was powerless to pull the delicate hair-trigger.

Melancholy came. He holstered the gun, buried his pain-wracked head in clutching hands and wept.

Finally the tears passed and he was calm. "—flew from the Yellowstone—" The future was ordained. He told Winslow to wheel out one of the gyrotonics, then gulped down tasteless food which served but to nauseate him—washed—dressed.

Slipping the blood-stained sheaf of papers into his reefer pockets, he climbed aboard the fat-bellied little ship,

calling to the hovering Winslow, "You might probe around those fossils with the excavator to see if there aren't some human bones."

He laughed a mad laugh and the old man cried out suddenly, earnestly, "Don't go, Russell! Believe me, it's madness—"

But Russ was jarring the auxiliaries, feeding the gyrotomics the tiny cubes which they blasted instantaneously into disassociated fragments of atoms, sending the ship whirling into the lower fringes of fleeing, dirty-gray clouds.

Leveling off at three thousand, he set the gyropilot on a Mercator, corrected it for magnetic variation, wind and compass deviation, and tried to make himself comfortable in the air-cushioned, seat.

He tried to set his mind on the beautiful mountaintops of the Absaroka Range streaming past the stubby wings. But despite his efforts, he kept thinking of the message out of time.

He found himself muttering the whole thing from memory: "When I arrived at Worland, Bara was in lab, preparing helix for time-casting. I pleaded desperately with her, knowing my future and being afraid of it—knowing I was about to kill her. She was unreasonable, stubborn—drove me to madness, arguing. Frenzy, dizzy with the lust to kill. Drew my gun, shot her between the eyes! Stumbled to that damned, lurking helix—"

He felt as though he had lived it—he *knows* he *had*! He visualized every moment with the keenest perception. The handwriting blazed and flamed through the corridors of his brain. There was something infinitely acute about his memory—that memory which he should not have! Something bestial and insane gibbered within his aching soul—

A HOARSE CRY came from his dry lips. He heard an irregular skip in the

atomic motors, flashed his eyes unbelievably to the instruments. *Afterjet 5's meter-reading was dropping to zero!*

The future was unraveling—time out of time—time into time—time out of mind! No. 5 had blasted! He screamed it hysterically into the winds—

A little hammer started beating, beating, drumming in his brain, bringing waves of madness. The atomic motors sang an erratic, savage paeon in unison with the hot blood whispering on his brain, until the whole universe seemed to be naught but a continual, tympanic fanfare of thunder. He saw before his quivering, nerve-torn eyes only that cursed writing and the black-and-red of age-dried blood—

Time and space shuddered into eternity—

And now the gyrotomic was heeling over and dropping softly on its spurring underjets before the laboratory at Worland. No one came forth to meet it.

Russ hastened unsteadily into the laboratory. Bara rose from a chair near the helix, and even through his blindness he saw tears on her cheeks. He took her in his strong arms and kissed her again and again—kissed her lips and clung to them and kissed her tears away. He felt that he could go on thus forever, kissing her; but hammering hotly in his brain was that insane, impossible memory, recurrent as the waves of an eternal sea. The memory which damned him to the fated sanguinary madness which smeared itself over his whole being, which damned him inflexibly to his stated doom.

"Russ, darling, what's the matter?" she asked anxiously, peering up into his troubled, twitching face.

"Nothing—only that you're going to leave me forever!" And it tore his soul to shreds to think on that!

"But I'm not, Russ; I'll be back in a few moments. (*"She was unreasonable, stubborn—"*) It has to work, dear—

est! Oh, please don't look at me that way, *please don't!*" His dilated eyes were feasting upon her face, devouring its every delineation as though he wanted always to remember her beauty in those moments before death would—

"*Russell!*" she screamed it.

He shook his massive, drumming head, tried to shake that numbing madness from his brain.

"Don't go!" he said jerkily. "Mustn't go—leave me—don't even try; don't—" Tears came into his eyes, cascaded down his drawn, taut cheeks. Suddenly he seemed sightlessly staring—a blind man tortured by a hell of memories.

She never knew what prompted her to do it. She slapped his face hard, twice. It cleared some corner of his brain but that dazed, irrational glare clung in his eyes like the flame in a warming dynamite gun.

"*Russ,*" she murmured, "okc, darling, I won't go. I won't leave you. You were right; you're always right—that's why I love you! I'll marry you, *Russ,* and we'll settle down and—*Oh,* please don't be like this!"

But the madness—the stark, chilling insanity—had conquered whatever there was of culture, refinement, and decency within him. He thrust her savagely from him. She struck against a sharp edge of the helix and he laughed jerkily at the cry of pain that came from her lips.

"You can't!" he screamed. "Can't—wrong, utterly wrong! Time message—must kill—*kill!*" His pupils were dilated; he clawed the gun from its holster, aimed it at her white, terrified face—"*KILL!*"

"*Russell!*" A voice knifed across *Russ Belding's* brain like lightning in a storm-blackened void, a crux unpropheied in the scheme-of-things-to-come, a voice damning that anomalous memory as a falsehood or as—*what?*

THE EXPLOPELLET, unfired, dropped from *Russ's* hand and he crumpled, unnerved and quivering, into a near-by chair, head bowed, voice murmuring half-coherent thoughts from a mind taxed almost beyond endurance.

Bara Lqwindi's unbelieving eyes were focused on the little old man, dressed in a geologist's garb, carrying a Bates disrupter, who stood framed in the doorway.

"Thank Heaven I was in time!" the old man whispered hoarsely.

"*Paul—I knew it! What—oh, what has done this to you?*" *Bara's* face was white as she viewed the tired, drawn, age-lined frailty of him whom she had known as *Paul Duhamel*. She thought of the finely built, smallish, middle-aged man with raven-black hair—the *Paul Duhamel* of thirteen short months before!

"I have been where man was never intended to go—across the borderline into that somewhere of madness that is Time itself!"

"—somewhere of madness—" she prompted as he paused.

A shudder seemed to run over him.

"You know, they joke about reincarnation in the past and future. They speak of subconscious recollections of repetitious happenings, ancestral memory and the like. It's all too very true and even—"

Bara had dropped on the arm of *Russ's* chair, was smoothing his tangled hair with quick, delicate fingers, silently soothing his shocked nervous system by her very presence.

"But what did this to *Russ*? Do you mean that this has happened to him—to us—before?"

"Yes—probably many times—and may happen again. The same circumstances will probably come again. Time runs in concentric circles, the cycle of life running in evolving incarnations.

"Somewhere in Space and Time there were other worlds like this—other ages

of Earth, duplicates of this, man, beast, flower and shrub, left to work out their prescribed destinies.

"I have been to another life of Earth; my helix was all too successful. I traversed time and space through the warp my engines made—past the beginning to another age which the helix brought so near to ours as to be almost coexistent with it. But that world was mad—a world where morals were unknown, ethics invalid, religion defiled and man a callous brute!"

Russ was alert now, wan, pale, listening to Duhamel's soft voice—a voice which grew frightened now at some recollected and untold horror and cast shadows of fleeting, satanic ghosts into the sunlit lab.

"I was like a god there, flashing across their time, unseen in the swiftness of my flight. The passing Duhamel of another age. Wandering here and there, warping the helix through space to study their hectic, tumultuous life, I waited myself back to their beginning, bent on learning the secrets of the cosmos.

"I saw the creation of all things. Nothingness and then suns and worlds flung out by an unseen, universal Stimulation. Things not vouchsafed for man to understand, unfathomable power unleashed—

"Tracing the ordered stages of their world—from creation even unto extinction—I glimpsed two men staggering across a rock-strewn strand of the paleozoic and slowed, amazed, into their time. I saw another Russell Belding slaying another Paul Duhamel—I saw the former, wounded and bleeding, scribbling what he deemed his dying words—those very words which you, Russell, read and which caused you, in individual memory and actuality, to become yourself as you were in that life! Mighty indeed is the power of suggestion upon a mind whose receptive senses have known and felt it throughout eternity!

"Dislocking the cylinder, he glimpsed me behind the recurrent evanescence of the helix and hurled it straight at me. It swerved through the helix, ruptured and dispersed the warp, vanished from that space-time into the paleozoic of this life of Earth, sped by the helix's power-life.

"Before I could rebuild the potential and time-cast, he had leaped into the helix beside me, the blood of my alter ego on his hands, his face mad, bestial and—

"And somehow we came down the ages. All the panorama of world's life, death and rebirth flashed before us. Invulnerable within the warp to outward changes, we watched man evolving and rising to tremendous heights, dying. Cosmic cataclysm and empty space—suns and planets flung out from their maternal, flaming maws—gradual cooling, life evolved from primal insuloria—fish, amphibian, reptile, mammal, while breaks and slips occurred in the crust through teeming volcanic action and stresses brought on by the tidal influence of the moon and by changes in the position of the polar axis—in short, a world's evolution!

"Always Belding threatened me with his gun and beat me, forcing me to stop in time to kill and plunder for food. To force a great surgeon of the Golden Age of his time to heal his frightful wound and then to ruthlessly kill him. 'I shall be a god!' he'd say and sate himself with knowledge, prating for hours about returning to his world with omniscience, bringing that world to this!

"Then, one day, the Yellowstone of 2012 A. D., and I stopped the helix in its flash through time and leaped out, setting the automatic zero-planes a-whirl. Belding flickered into nothingness—

"Somewhere in time a madman is prowling with my blood on his soul, searching for me to take it again! For without those zero-plane settings he cannot know which Earth is ours!"

HE STOPPED and stared wearily into nothingness.

And Bara and Russ knew now why Paul Duhamel had kept his silence these many months; knew why he had become suddenly so old and drawn and tired of life— He had found what had happened to man from oblivion to oblivion. He had knowledge of all things and was afraid to let man know, not only because man would mock him and call him mad, but that such knowledge could bring no happiness and prosperity to Earth. Only grief and madness. They knew now the meaning of a weary, omniscient soul crying in hell-agony, "Oh, Lord, is he coming back?"

Paul was speaking again, almost inaudibly: "None of these were coincidences—rather, the workings of minds so nearly alike, following prescribed channels which nothing could alter or change: save the conscience of the individual. The subconscious mind directing the individual along life's path, the conscious subtly differentiating and improving the progress.

"I like to think that the Creator has decided time and again to revise and improve the world. I like to think that He is searching for improvement, building worlds anew upon the soul-fragments and subconscious intellects of the previous worlds. A great cosmic drama rehearsed again and again until the ultimate—perfection!

"I wish I could have died with the other Martyrs rather than become what I am—knowing more than a common mortal should—or should I say, 'common immortal'?—haunted by the constant threat of a madman stalking me. I wish I hadn't made that last minute alteration which saved me from death

and, unchanged on the blue prints, sent the Martyrs to theirs!"

Russ came erect and a flame burned in his young eyes—the flame of revolt against something beyond man's mental capacity.

"It's hard to understand!" he said slowly, "but it seems that I must go and, in a strange sense, kill myself. Perhaps it will circumvent my immortality. Anyway, I am going in the helix and try somehow to erase from Time the mistake that is, or was or will be Russ Belding—"

He brushed his lips against Bara's cheek and stepped blindly toward the helix. Paul Duhamel was there before him.

"Russell!" the young-old man said, "at least God can give you and Bara happiness in this life. So take it and may He bless you. I am an old man now and have but little time to right a wrong which I once thought could not be rectified. I am going to blot the Frankenstein-child of Paul Duhamel from the world for all eternity, and the runaway soul of Russell Belding from the affairs of Man—"

Once again Paul Duhamel dimmed and vanished. The inward sigh of the air as the vacuum of the timecaster subsided, whispered through the laboratory with a little note of requiem for the man who had gone—now—forever. Paul Duhamel was bound on a quest through time and space and eternity, toward the sure, yet ever-repeated ending of all things. That false, unreal immortality that he had engendered was about to drop away.

Yet there was nothing of sadness in him. For Martyrs don't mind dying, when the Thing in Itself seems great enough—

NOTICE—All stories in Street & Smith's magazines are new. No reprints are ever used.

Power Plants of Tomorrow

by
Willey Ley

The last of a short series of science articles on future power sources—"Putting The Moon on The Job"—

THE waters of the seas are alluring. They promise travel, adventure, danger and thrills. And—they promise wealth, too.

Once it was the wealth of pirate loot or of jetsam, amber and pearls. Now we are seeking a more precious wealth in the waters of the seas. It is neither pirate treasure nor the gold dissolved in the waves; it is power. The waves of the seas, the winds of the seas, the tides of the seas—almost anything that has to do with salt water abounds with power. There is power in the difference between the temperatures of surface water and of ground water in the tropical seas, and there is power in the difference between the temperatures of the water of the Arctic Ocean and of the ice floating upon its surface.

Every one of these possible sources of power has been investigated theoretically, and it has been found that every one of them is large enough to furnish all the power needed by civilization. The question is how to harness these powers, and how to harness them efficiently. Not all the various sources of power offered by the seas are equally useful, because not all of them are steady enough for the needs of industry. A hundred years ago it may have been a good excuse for not running the mill because there was

no wind blowing for a week or so. In our time we cannot waste time waiting for favorable weather. Our sources of power have to be reliable and steady.

Although wind is proverbially unreliable, there are still many engineers that busy themselves with the problem of harnessing wind power. The problem looks easy—it apparently only calls for a sensible application of the laws of aerodynamics to the old windmill.

There is such a "modernized windmill" running and generating electric power since 1931 near Balaklava, Crimea, USSR. It looks odd for some reason, somewhat resembling an airplane that crashed on top of an oil well and broke its wings. But this modern development of the old, picturesque windmills works well, does not have to have many repairs, and generated approximately 200,000 kilowatt hours per year since it was built. Therefore one can understand that the Russian experts are quite satisfied, and plan a much larger power plant of the same type. They are well acquainted from experience with the unreliability of the wind, however, and do not propose to use the power they expect to harness for any work that has to be done on schedule. It must be hard to find such work in Russia.

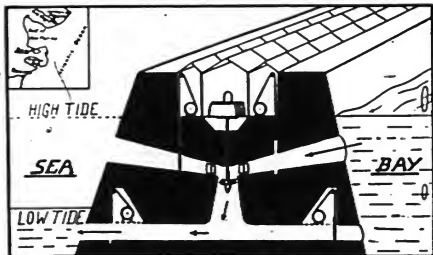


Diagram of proposed Argentine tide-power plant. Note that the control gates are so arranged that, whether bay or sea has the higher level, the direction of flow of water past the turbine blades may be made the same.

Another interesting means of harnessing wind power has been developed in France in the aerodynamic laboratories of Saint Cyr. Oddly enough, it looks very similar to Dubos' solar power plant. Its construction is of extreme simplicity. It consists of a metal chimney with a wide collar attached around its mouth. Wind coming from any direction will cause a suction effect, which makes a horizontally mounted wind turbine turn. The turbine is placed in the lower part of the chimney. The French claim that this device has an efficiency of 100% and that it represents "the perfect wind tower." In any event, it is the simplest wind power engine yet invented, and successfully avoids the disadvantage of being inefficient if it does not point exactly toward the direction of the wind.

Anything that can be said, and has been said, against wind power plants applies to the fullest extent to the wave engines that have been conceived by so many inventors. Wave power plants

seem so very easy in principle—a number of floating pontoons anchored along a bridge construction equipped with levers that transfer the up-and-down movement of the pontoons, to a shaft, constitute the driving force. The shaft then turns a pumping mechanism which pumps water into a reservoir situated near by in an elevated position. The conversion into electric power is then accomplished by a normal water power plant.

THEORETICALLY, there are but few difficulties to make the power of the waves steady in this manner. Actually, such a power plant would suffer many losses, such as friction of the various levers and gears, and evaporation from the open reservoir, to name but a few. One may dismiss consideration of these obstacles in view of the magnitude of the power available. Still, it has to be admitted that the power would not be reliable unless the power plant is built at a seashore, where there is heavy sea

almost every day of the year, and where at the same time a large natural reservoir considerably higher than sea level is available. Doubtless there are shores that fulfill all these conditions, but they are rare and the majority of them are situated in places where there will be little need for power within the next few centuries.

The reproach of unreliability does not apply to the projects that work with a difference of temperature, either between surface water and ground water of a warm sea, or between surface ice and the water underneath a cold sea. The latter project is connected with the name of the physicist Doctor Barjot, the former has become known mainly through the experiments of Professor Georges Claude.

While Barjot's plans have not yet progressed beyond the stage of calculation and investigation, Claude was fortunate enough to be able to make quite extensive practical experiments on a rather large scale.

Claude's idea is to utilize the difference in temperature between surface water at about 30°C. and ground water at about 10°C. or lower to drive a low pressure steam engine or steam turbine. But it is not really his idea. It was suggested for the first time by Professor d'Arsonval in a paper published on September 17, 1881, in the *Revue Scientifique*.

At that time, not much attention was paid to the suggestion although d'Arsonval was a famous physicist. In November, 1926, Professor Claude and P. Boucherot jointly submitted a report to the French Academy of Sciences which dealt with experiments made with working models of a low pressure power plant operating on a temperature difference of only 15°C. Some time later this model—or a similar one—was demonstrated to the members of the Academy, and in April, 1928, Claude and Boucherot put the finishing touches

to a power plant near Ougrée-Marhay (Belgium) which was visited by many interested scientists. The turbine worked well and generated about three times as much power as was consumed by the auxiliary machinery necessary for the novel arrangement. A still larger experimental power plant on the northern shore of Cuba followed. Claude had much bad luck with this plant. Twice, the mile-long tube that was to bring cold ground water to the surface was lost or ruined, and when the plant was finally finished it was found that the auxiliary machines used up more power than was generated by the turbines and dynamos.

The experiments at Matanzas da Cuba were a complete failure as far as this particular venture was concerned, but they did not disprove the feasibility of the principle. In fact, Claude was not discouraged, and had the French steamer *Tamie* rebuilt for his purposes. Much of his trouble had been caused by the fact that the floor of the sea sloped downward very gradually, which necessitated a tube 2000 meters in length to reach a depth of about 700 meters. Dangling from the ship, the tube could be much shorter, since it could be made to stand practically vertical in the water. This reduced the power lost in pumping the cool water. Surprisingly enough, the new power plant was not a great success either. There was always trouble with the long tube and with the auxiliary machinery.

WHEN these failures of the application of a sound principle became known, the Germans, Wilhelm Schmidt and Dr. E. Bräuer pointed out that they had published (independent of each other) treatises on very similar power plants in 1922 and in 1924 respectively. Both of them had apparently known of d'Arsonval's paper, and had not deviated from his suggestions as had Claude. If their scheme (which involves the use

of liquids of low boiling point, instead of water in a partial vacuum, as tried by Claude) were followed, some of the auxiliary pumps and condensers would become obsolete, which might simplify the plant sufficiently to make it practicable.

Dr. Barjot's suggestion is essentially the same, but works with still lower temperatures. While the d'Arsonval-Claude-Schmidt-Bräuer project applies a "hot" liquid of 30°C. and a "cold" one of about 8 or 10°C., Barjot wants to use water of only about 4°C. as his "hot" liquid, and cold air, or ice, at more than 20°C. below freezing point. His proposed power plants have two tremendous advantages: they will be established in regions where there is no other source of power, and they lack the long tube that annoyed Claude so much. Barjot's water tube is only long enough to reach through the ice a few dozen meters at most.

Claude's project, as well as Barjot's, is actually a solar power plant. The difficulties encountered in the various experiments show again that it is by no means easy to harness solar power.

But what about Lunar Power?

Everybody knows its manifestation—the tides. Their power is so enormous that we can afford to neglect solar energy if we succeed in putting the moon on the job to supply our energy needs.

Primitive tide power plants have existed about as long as windmills. The first watermills running with the stream of the tides are mentioned as early as the eleventh century, and since then the problem has again and again tempted the imagination of inventors. But it needed the development of electrical power engineering to ripen the various ideas for serious discussion.

Probably the first experimental electric tidal power plant was built in 1913 near Husum, on the North Sea, by an engineer from Hamburg, E. F. Peine.

Peine planned several large tidal power plants. The small experimental plant near Husum was only to answer certain questions frequently brought up in scientific meetings. The small plant was a complete success; all the assertions Peine had made were proven to be correct. Unfortunately, the work was interrupted by the World War, and was not resumed afterward in Germany.

But other countries began to pay attention to the "new" method to win power from other sources than coal and oil. Soon after the war, a medium-sized tidal power plant was installed at the mouth of the river Diouris in the Betagne, France. Naturally, tidal power plants work intermittently; therefore the French plant was coupled with another power plant six kilometers upstream. Both together furnish the current needed in the arsenals of Brest, the nearest larger town.

It seems that tidal power plants will be of great importance in the near future. There are only minor practical difficulties to be overcome. But they do have the big drawback that their power is not steady. The best of many possible solutions for this drawback seems to be the one that has been suggested for steadying the power of wave power plants. As long as the tides are running in or out there will be some excess power that can be used to pump water into an elevated reservoir. This then helps to supply the demand during the comparatively short pauses between the tides. It is true that this auxiliary power plant increases capital expenditure in an unpleasant manner, but there is no other way to do it. The other methods of storing electric energy are still more expensive.

THE LARGEST project among the many that have been made is still the one that was announced several years ago in England. There is usually a very high tide at the mouth of the river Severn

where it empties into Bristol Channel. The project called for damming Bristol Channel near Beachley, for building a long-needed railway bridge close to the dam, for creating an artificial lake near Timern by draining the river Wye and for installing a power plant of about half a million horsepower. The probable costs of this gigantic project were estimated at 30 million pounds.

The project soon found severe criticism and finally it was decided not to continue until a number of technical questions were solved. For this purpose, a small experimental plant was built in the vicinity of the planned dam. The engineers that constructed it tried to find a solution for storing the power other than in an artificial lake. For auxiliary power they used a steam power plant with electrically heated boilers. They then constructed a large heat-insulated storage boiler to store steam. If this method works out as well as it is hoped by its inventors, it will be an important step on the way to efficient tidal power plants.

Of the many other projects, only the one of San José Bay in the Argentine shall be mentioned. Conditions for a tidal power plant are ideal in this spot. San José Bay has an area of not less than 780 square kilometers, but to dam it, a dam only seven kilometers in length would be necessary, because its mouth is very narrow. At the same time, there are always strong and high tides to be

found in the Gulf of San Matias. And, since the bay south of San José Bay, Nueva Bay, gives access to the same territory controlled by San José Bay, it would not even be necessary to put locks in the dam, which, of course, makes matters easier and saves much money.

It has been calculated that the dam could conveniently hold 376 sets of water turbines, coupled with generators. About 15 million kilowatt hours would be generated daily—twice this amount when there is spring-tide. The pauses between the tides would last only for one and a quarter hours, which could be bridged easily. Since the Republic of Argentine has to import several millions of tons of coal per year, one can understand that the government is very much interested in tidal power plants, and has had a number of other bays with similarly favorable conditions investigated for the same purpose.

The plans for "Lunar Power Plants," harnessing the energy of the tides, have doubtless progressed farther than any other plans for finding and harnessing new sources of energy. Only volcanic power plants have progressed beyond that stage; they are already in existence. If one compares the matter-of-fact language of tidal power plant inventors, with the many "if's" in the speeches of scientists trying to harness solar power, one feels like abandoning solar power altogether and putting the moon to the job instead.

Thomas Calvert McClary

Author of "Rebirth"

Brings a great new serial beginning in the
April Astounding—

"Three Thousand Years!"

SCIENCE DISCUSSIONS AND BRASS TACKS



Ore by the cubic mile!

Dear Mr. Campbell:

As iron is run across recently might be of interest to Science Discussions. Magnesium (density 1.74) is about 65% as heavy as aluminum (density 2.71). A new process has been developed for the commercial production of magnesium, which is expected to lower the price of the raw metal. Aligned to "dowmetal", a magnesium alloy, it makes an extremely light structural metal of strength comparable to that of aluminum alloys.

The new process consists of roasting magnesium carbonate (dolomite) to the oxide, then mixing the oxide with coke in an electric furnace. Magnesium metal is distilled out in fairly pure condition, and can be further purified by rectification. The interesting point is that dolomite is the raw material. On the West Coast, there is a deposit of dolomite, a little thing, containing, so mineralogists say, two cubic miles of the substance nearly 95% pure! That is one deposit!—Arthur McCann, 761 Scotland Road, Orange, N. J.

Possible source of Cosmic Rays?

Dear Editor:

Never broke into print in my life, but a few comments on both Science Discussions, and Brass Tacks are in order.

First, Science Discussions: They are the first thing in your magazine which I turn to. I have learned a lot from them. Keep it up. My opinion on the question of the vanishing hydrometer is the same as that of M. A. Rothman, Philadelphia, Pa. The index of refraction of the container, plus that of the alcohol, was probably the same as the index of the glass used in the hydrometer. A little study of the

index of refraction of all objects concerned should prove this to Mr. Turner's satisfaction.

Second, light emission from an object traveling above 186,000 miles per second: Such light must have the speed of the objects which emit it added to its own speed. An object traveling at speed approaching light would shift its spectrum into the ultraviolet, as we approached it, or as it approached us. Seems to me I have read of this before. Also an object going away from us would shift its spectrum into the infrared. Could this shifting be responsible for emission of cosmic rays? Yes or no? Additive motion would seem to compress the frequency of light, giving us higher frequencies than the original. Admitted, no such phenomena have been observed. Yet couldn't it happen? There are only my own deductions and I may be all wrong. Yet they seem to be plausible, if not possible.

Third, in answer to L. J. Ross, of Gainesville, Florida. The only point I disagree on is the possibility of a temperature of 10,000° in transition. Consider, that the object is composed of only pure iron, but that its pressure were increased almost indefinitely, so would be the case of a meteor approaching earth at great speed. Would not the temperature be higher than the mere boiling point of iron? Water boils at 212° F. yet when compressed and super-heated, the temperature may rise to many times the boiling point of water. Such compression could result from the rapid motion of a meteor through our atmosphere and the result would be much greater temperatures than normally possible on earth. Compression density of air at the speed of fast airplanes is approximately that of water. What would it be at speeds which meteors attain? My only theory is that matter, as we know it, will exhibit strange tendencies as temperature and pressure are changed from those normally encountered. Witness the fact that lead becomes a perfect conductor at, or near, absolute zero.

Your magazine is the tops. Keep it that way. Best wishes for continued success and may this wrap the fate of many others.—P. C. Brenner, 4115 Congress, Chicago, Illinois.

Quantum mechanics shows, however, that 3 bodies each going 185,000 m.p.s. in opposite directions, are travelling less than 185,000 m.p.s. with respect to each other!

Dear Editor:

There seems to be considerable consternation in the camp with regard to the problem of the possibility of light being emitted from a body travelling at over the speed of light. I should have thought that some of your readers who have just finished an elementary Physics course would have solved it before now. As they have not, I submit the following solution to their teacher's queries:

Any body or particle emitted from a moving body must have a velocity equal to the algebraic sum of the two velocities. Assume that a body moving at the speed of light (i.e. with velocity V) emits a particle having a relative velocity also $= V$. Then in the forward direction the particle will have a velocity equal to $2V$, and in the backwards direction a velocity equal to $V - V = 0$. Simple trigonometry will give the velocity of the particle at any angle of emission between these two limits.

Now, light in motion possesses kinetic energy, and is subject therefore to the equation of dynamics: $K.E. = \frac{1}{2} M V^2$ where $K.E.$ is kinetic energy, M the mass of the body and V the velocity of the body. In consideration of the right hand side of the equation, it will be seen that a slight increase in V , gives rise to a very large decrease of M . But, as the maximum size of a particle of light is fixed, it naturally follows that any increase, save for a very very small fraction, of V leads to M being reduced below the minimum necessary size and the particle can no longer exist as light. Similarly, any decrease of V leads to an increase in M to the point again where the particle is no longer light.

I can see a number of readers objecting on the grounds that light is not a particle but a wave form. For them I would recommend the consideration of the formulae of all wave forms: $V = f \lambda$ where V is velocity, f is wave length and f frequency of the wave.

If now we increase V above the speed of light, we must vary to inverse proportion either of the other two factors. The wave length of light varies with its color, being roughly 4,000 Angstrom units for violet and 1,000 Angstrom units for red. Any wave length outside these limits is not visible as light. Hence, with a velocity greater than $V = 185,000$ miles per second (approximately) or less than $V = 185,000$ miles per second, light, as such, cannot exist.

There is, of course, one angle of emission which gives a velocity to the light, in some cases, of 185,000 m.p.s. and along this line the body would be visible, but it would entail the movement of the observer being matched at this particular angle, to the exact velocity of the moving body, which, of course, is not practicable.

—J. Lighthorn Church, View, Vicarage Street, Newcastle, England

could be called man has existed for over a million years. They have found fossils of half-man and half-ape. None, however, were true homo-sapiens. This does not prove that there was a more advanced species than is extant.

Anthropologists do know that homo-sapiens have advanced very little if at all in the past five or six thousand years. So you can imagine how long it must have taken to evolve up to them. I am of the opinion that the Bible was not so far wrong in its story of the creation of man, that is, to so far as the length of time it took to form mankind. Let me explain myself: today, scientists are experimenting with the mutation of species, which mostly consists of subjecting the eggs or female lower forms of life to X-rays, ultraviolet rays, radium rays, etc. The offspring of the parents in many cases are totally different species. Therefore, who could have provided a tribe of these half-men from camping or living in a cave that was situated near a large deposit of radium. If you think that there could have been no such large deposit, don't forget that every prehistoric land deposit was once a radium hole. (These places by the way would make an excellent place for archaeologists to search for specimens if it weren't for the fact that the radium would disintegrate before left there for any length of time.) From these half-men could have sprung children who were so different from their parents that many were killed by their neighbors out of fear or hatred. But who can say that some prehistoric mother didn't shield her child against the others until it was able to shift for itself and find others in the same predicament, and finally be numerous enough to circumvent its cruel ancestors and occupy the same cave and have the same process repeated time and again. Until about a million years ago there was a species of man very much like us today. Take, for instance, the Cro-Magnon Man who was as intelligent (but not as well educated—don't get this mixed) as we are. Only some disease or catastrophe kept them from being the apex of evolution today. Therefore why couldn't some race of these men have developed such a high civilization as to have left impressions of it in legends until today. For small details of such substantiation from former civilizations, I refer you to the many books written on this subject. I will not attempt to describe their towns or mode of life or color, etc., but someday someone will attribute again to a degraded state which will solve the mystery.

Just to show you nothing improved is positive, I just happened to think that stories of the earliest cities of Asia Minor could have circulated among the savage tribes of Europe and their contemporaries and started those legends which with time have settled down to the story of Atlantis. This contention adds my entire foregoing letter and goes further to aid your argument which all reasonable people, but kind facts are certain. —George Trost, 1237 Great Avenue, Bronx, New York City

Maybe it isn't reversible.

Dear Sir:

A sage observation found in John Russell Fearn's "Dark Heresies" prompts me to write again. To quote from the story (page 20):

"matter is impossible without mind. Conversely, without mind there cannot be matter."

I think you've got something, there, Mr. Fearn!

To turn from the first story to the last, let's consider Knud Rindler's "Time Contractor". The doubling of "absolute space", therein, seems (to me at least) very like measuring a centimeter in terms of centimeters. Also, mention is made of rectifying apparatus to a source of seven million electron volts by means of cables: Now these seven million electron volts represented nothing more or less than the energy of the stream of rapidly moving particles furnished by

It's true Man must have arisen as a mutant.

Dear Editor:

In answer to Mr. John Boddier regarding his argument that there was no Atlantis or No:

First: For every unproved assumption or statement there are always two sides, pro and con.

Second: No one can rightly insist that he is absolutely right whatever side he takes, without irrevocable proof.

Therefore let me state my arguments (while some are far-fetched and obscure) in favor of the existence of either Atlantis or No:

As far as present day science knows, what

a cyclotron. And how are such particles, moving at extreme speeds, to be threaded through a cable? However, there's no brilliant insight here—just a question. The story itself was excellent. The conventional "first person" style reminds one of Weinbaum.—Norman F. Stanley, 41A Broad Street, Rockland, Maine

Uranium Carbide (a solid) and water react to produce a gasolinelike fuel—probably the source of many water+pill=gasoline rumors. Expenses are badly twisted, however, in rumors

Dear Mr. Campbell:

I wish to bring to the attention of readers of this magazine several "discoveries" and so-called marvelous "inventions" described in newspapers and magazines.

The first two concern the ever-present problems of cheaper motor fuel or motor-gasoline mileage.

In 1917, I read, a chemist named Andrews discovered a chemical solution, two cents worth of which, when added to a gallon of water, gave it the explosive force of gasoline. Earl F. Jenson, Walter Morfischer and others witnessed a test of this mixture. Andrews mixed some of his chemical with water drawn from the Navy Yard hydrant and put the solution in a Navy motorboat engine. The motor started immediately, and ran as well as with gasoline. (There was a slight adjustment to the carburetor.) The Navy Yard, on following up this invention, found that Andrews had disappeared. He was never heard of again.

Next is a wonderful carburetor invented a few years ago by Fegus, a man from Winnipeg, Canada. He claimed this carburetor would give two hundred miles to a gallon of gas. A manufacturer investigated this, tested the gadget, and the papers said that he found the carburetor to be all the inventor claimed. Yet he did not buy it. Why? I do not know.

A vague newspaper report that I read stated that a young man was working on an invention which, he said, might enable man to make trips to Mars and Venus, and almost certainly would facilitate exploration of the stratosphere. Well, we wish him luck!

Every once and a while I see a note in the paper to the effect that Seaton, in Europe, has discovered a ray which makes human beings invisible. An Italian inventor made two women who were in conversation invisible. (He couldn't stop them talking, however.)

Well, wishing you and your magazine luck—
Frank W. Meier, 214 Third Ave., Ottawa, Can.

Escape

Dear Editor:

May I take it upon myself to attempt to settle some for all this wrangling over "escape velocity"? As applied to the Earth, escape velocity is simply the velocity which must be imparted upon a body in order to throw it clear

of the Earth's gravitational field, this velocity being applied at the instant the body leaves the Earth's surface, and no other velocity being added afterwards. Theoretically, it is 6.52 miles per second, but due to the atmospheric envelope and the resistance it entails, this escape velocity is slightly higher. We would have an example of this sort if a projectile were fired from a gun with a velocity of 7 m.p.s. (approximately). It is possible for a body to escape from the Earth's gravitational field with any considerable velocity whatever, short of the velocity of light, provided it maintains a continuous acceleration. Of course, one could also escape with a changing velocity, and this would require either a continuous or an intermittent acceleration.

I have not mentioned that the Earth's gravitational field extends to infinity (whatever or wherever that is), but because of intermingling fields of our neighboring planets, it is not necessary to hurl the projectile more than a distance of the order of millions of miles at most.

To those of you with technical training that happen to read this, I apologize for skirting over certain details of this matter and the inadequate formulation of some of my statements.

I should be very glad to answer any letters from those interested in this problem.—William H. Fell, University of Kentucky, Lexington, Ky.

"Bends" results from nitrogen bubbles freed in the blood, like the bubbles in soda water. A considerable lowering of pressure is required to cause it.

Dear Editor:

I object strenuously to Mr. Lionel Herman's statement to the effect that the Earth's core is similar to whipped cream and, therefore, is not another state of matter. The states of matter are classified both physically and chemically, and in both of these respects the Earth's core must vary appreciably from the characteristics it would assume under ordinary conditions. Whipped cream, if subjected to huge pressures, would certainly not retain its ordinary state, and if subjected to greatly reduced pressures, would certainly not become a solid; therefore, it is my opinion that a stress-field is another state of matter where the conditions needed to change it do not harmonize with the ones needed to effect a similar change in whipped cream.

In my estimation for a giant spaceship to retain an atmosphere for an appreciable interval, if Mr. Herman doubts me, let him but stand on a streetcar when the latter is starting or stopping. Earth does not stop and start, so would a spaceship.

About this problem of a human subjected to conditions of outer space: don't you think he would suffer "diver's bends"? I do not clearly understand the causes of the latter, but I understand that they involve a reduction of pressure. I would greatly appreciate it if some reader would show a lucid explanation.—Casper Pierog, 5261 Detroit Avenue, Cleveland, Ohio.

The Department of Prophecy— "In Times To Come"

Brass Tacks

Notice the unusual variation of opinions on "Whispering Satellite".

Dear Mr. Campbell:

I am extremely glad to see that you are not trying to hide the fact that you have been made editor of *Amazing*. I was half afraid that your appointment would result in another several years' search, such as we went through until your predecessor was lured a few years ago.

But now, what is this "change" going to be? I know I should wait till next January 15 for the answer, but I am more than anxious. It appears that a general turn-over is taking place in the science-fiction world.

And while I'm about it, here are some check marks for your chart: "Red Heritage" by John Russell Fearn was tops among the novella. Brown's tale, "Dead Knowledge," rated second place with, incidentally, the best illustrations in the entire issue. Third is "Ordnance of Reasoning", a typical Van Lorne opus. It rounded me greatly of his "Strange Ops" in the January 1934 number. Still, though, I don't think it should rate a cover. Of the shorts, "The Mental Ultimate" was undoubtedly the best in a long while, with a nearly new plot and a new author. The biological tale, "Pithecanthropus Rejected", by Manly Wade Wellman comes next with "The Voice Out of Space" trailing far behind. It's try, try, again with Krass I guess. And far out of sight is Thornton Ayre's "Whispering Satellite". Was he trying to copy Weinbaum? It certainly seemed like it, though the imitation was so poor it could hardly be called such. "Galactic Patrol" is, as usual, keeping up its big work. It's unquestionably the most outstanding serial since 1934. The science articles were very digestible, though I would rather see Willy Ley write on rocket power than power plants. Brass Tacks is of course welcomed back with rejoicing. The new heading is perfect. But I did not like to see the letters surrounded by ads. That is the one and only fault that I can find with your editorial policy. Well, you might add comments to the letters! Nevertheless, things look very rosy for 1935—James B. Avery, 55 Middle St., Shawhegan, Maine.

"Whispering Satellite" good.

Dear Editor:

I've just been reading your January issue and must say your magazine gets better by the month. All of those stories were swell, starting "Red Heritage", and "The Mental Ultimate", "Galactic Patrol", "Ordnance of Reasoning" and "The Whispering Satellite" are first-class. I liked greatly "Dead Knowledge" and "Pithecanthropus Rejected". Have you any more stories of that type?

The return of Brass Tacks is like a breath of cool air after breathing the stuffy, theorizing, argumentative air of Science Fictionists. And so for those science fiatters, they alone are worth twenty cents. I noticed most of the illustrations in January issue were done by Jack Binder. I think he should illustrate all the stories.

So far, at least one-third of all science-fiction stories I've read in this and other magazines deal directly or indirectly with the possibility of travel in time, or space. I've been reading up on this subject, and subjects able to mental science, and will gladly answer all letters from science fans on this or any other scientific subjects. I would enjoy a correspondence with some of you, so please write—Mortimer T. Cohen, 68 West 33rd Street, Apt. 7b, New York City.

Kimball Kinnison, attention: Somebody doesn't like you!

Dear Editor:

We've had enough of this. After reading the praises in the January edition of that abominable story "Galactic Patrol", we sat down and with much disgust wrote this letter. Our personal, and highly valued opinion, is as follows:

This so-called story is without doubt the most despicable, insane piece of literature, if such it is, that has ever disgraced a science-fiction magazine. If this idiotic story is concluded by the year in which it supposedly takes place, we'll about in short order, "Will wonders never cease?"

Is it possible that the mind of a certain P.D. (if such he is) while procuring his degree, ran in its present channels?

When and if this story is finished, I shall send the completed novel to the library of our local insane Asylum. We highly recommend it to mothers for frightening naughty children, its author could easily secure a contract writing scripts for Boris Karloff pictures.

Kindly refund twenty cents to each of us for each edition in which this boring novel has made its unwanted appearance.

We suggest the title for the next several hundred installments be changed to "Scourge of a P.D." or "Nightmare of a P.D."

Yours disgustingly—Don Howell, 2115 Riverside Ave., and James Ladd, 2708 Marshall Street, Jacksonville, Florida.

P. B. Condensed: "Galactic Patrol" just stinks.

Schoermer—at your service!

Dear Editor:

Now that Brass Tacks is back, I will proceed to voice a few opinions which have lain dormant during the reign of Science Fictionists. But that I was opposed to the latter; I really thought it raised our magazine to a new high, and I am glad to see that you have retained it as a regular department. But through Brass Tacks one can express his ideas on a certain story, and at the same time have the satisfaction of knowing how others felt about it.

I have a suggestion as to a new department for *Amazing*, which I think some readers will agree would be an interesting addition to the magazine. Every month you could list the stories of the previous month in the order of their popularity, first, second, third, etc. I for one would like to see if the stories that I liked best were also liked best by the majority of readers, or, for that matter, vice versa.

Concerning the stories: The best serial complete in 1935 was "Infra Calverne", with "Frontier of the Unknown" a very close second. How about some more from Norman L. Knight? As to "Galactic Patrol", it is undoubtedly one of the greatest science-fiction stories ever written. Dr. Smith's ideas are all new ones and his style is different and refreshing. He is an author that writes a story for the story and not for the profit. I have enjoyed every issue of "Galactic Patrol" and have only one criticism to make. That concerns the fifth part in the January issue. Too much detail was written about Kinnison's recovery in the hospital. This part of the story had nothing to do with the main part of the plot and could have been passed over in much less space.

So you, Mr. Campbell are now editor. I am glad to hear of this, but I am also sorry. Now that your science articles on the solar system were finished, I had expected a story from you soon. You probably won't have time now with your new duties.

I have not read all the stories of the January issue yet, but I certainly did enjoy "Whispering Satellite". Even though a short story, it well deserved having its title on the cover. Willy Ley's article was very good, but "Rocket Flight" was too full of mathematical terms to be interesting.

Now about the artists. Why don't you give David Moore a chance at illustrating? At his best I consider him superior to any other science-fiction artist. At one time, he was chief illustrator for our magazine, but now he is given only two or three short stories to illustrate. I also like Blonder and Wenne a great deal, although I do not think the latter, at present, is at his best as the interior. Illustrating for two magazines as he is, he doesn't have time to do as accurate work as he used to. And where is that fine artist Schenckman? The few artists mentioned are the best in the field, and if you obtain Schenckman you will have a perfectly illustrated magazine.—Peter H. Rava, 206 15th Ave., North Seattle, Wash.

Brass Tacks heading was not picked from past illustrations.

Dear Mr. Campbell:

On the eve of the first mutation, let us take one last look at the past. The January "Ascending" was an issue of extremes. The cover was one of the poorest I have ever seen for some time. It says nothing in Van Lorne's story of a ship green, yellow and blue in color. Why then, this group?

"Ornery of Reversion" was good enough to hold my interest, but it was not up to Van Lorne's standard. "Remember 'Strange City' and its sequel." "Dead Knowledge" also was rather a disappointment. "Red Heritage" was excellent, the best of the month. "The Voice Out of Space" was only fair. "Pictographing Subject" I cannot possibly classify as a science-fiction story. The worst in all months. What's happened? "Whispering Satellite" was very good. Second best of the month. "The Mental Chameleon" was okay—a narrow margin. "Galactic Patrol" gains momentum as the climax is reached. "Galactic Patrol" will crown the "Skyhawk" series. The science features I found very instructive.

And now, major brickbat number one: the picture illustrating Brass Tacks, page 51, does not serve its purpose and is hardly suitable. I engaged a cartoonist for the illustration of Brass Tacks. Cartoonists would pick them from any issue of the magazine, writing a two hundred and fifty word essay telling why they think their cartoon is suitable. How about it?

The magazine shows the influence of its new editor a mile away. In times to come is a fine idea. May the first mutation bring many more of them.—Mark Edensberg, 426 East Street, Chicago, Illinois.

This one travelled 0.0445 light-seconds getting here.

Dear Editor:

Although this is my first letter, I would like you to know that I am not a new reader.

"The Endless Chair" was very good and the best in April's issue.

One of your rivals has begged Raymond E. Gallen. He is one of your most reliable authors, as his stories are usually readable and contain original themes. Get him back!

Don A. Stuart has not appeared since "Frictional Losses" in July 1936. What has happened to him? I am sure other readers as well as I would like to see more of his work published. Incidentally, I consider "Twilight" by that author the best short story I have ever seen. Sorry that I missed "Night", it's equal.

Comment on November's issue:

Cover: O. K. by me, although I do not consider it very good. So Wenne's doing is open.

Illustrations: Mr. Armitage is right. Duff's illustrations are not what they used to be. Give him a rest. He needs it. And where's Paul? Get him to do some illustrating for you.

"The Golden Hammer" by Arthur J. Burke was good.

"Queen Of The Sky" by Rando Blonder: What made you accept that story? It was terrible. They have done better than that.

"Martian" by Van Lorne was absolutely rotten!

"Lost in Dimensions" by Schenckman contained the old science-fiction formula. The villain appears from the fourth dimension and kidnaps the heroine of the story. The hero rescues her and tells the villain's plan and "so they lived happily ever after." Here is another rotten yarn.

"A Surgical Error" by Cools: I did not expect this one to be good but I was pleasantly surprised. Here is a story that contains an original theme and is well written. Well done, Cools!

"Galactic Patrol" by R. E. Smith. I have not read this yet. I want to buy the issues containing the preceding parts. At present I have only November's number. Provided they are in good condition I will pay twenty cents for a copy. Can I obtain them directly from you? I know it is not regular but have a heart. If that cannot be done, will you please publish this letter as there may be readers who wish to sell their's.

Articles: I would like to see less of these, as I believe the majority of readers read your mag for its stories and not the articles. By all means print one article per month, but do not overdo it. They take up valuable space.

Are you going to print no more thought variant stories? I realize that you have not printed any for quite a long time.

Brass Tacks: I would like you to reclassify this department as I consider it more valuable than Science Discussions. Some of the letters in the latter department can appear in Brass Tacks as well.

I have said all I want to say at the present moment and if you think I am a bit blunt, please forgive me as I honestly wish to help you to improve this magazine.

Thank you for reading this letter.—John Becker, 34 Canton Road, Top Floor, Kowloon, Hong Kong.

Mr. Burdett: We are acting on this.

Dear Editor,

Did it ever occur to you that there is such a place as New Zealand? I thought not, that is why I have written this. I notice that every time you conclude your editorial page, you put forward a sort of plea asking or to encourage at least one more reader. Well's Gates Man! There are hundreds, possibly thousands out here just waiting, as your publication is the only science-fiction mag that does not appear on the newsstands here in N. Z.

I have been getting your magazine since early last year, and have been promising myself to drop you a note about the deplorable state of affairs, when bang! you spring Science Discussions on us, and thinking that this letter would not get a hearing I just sort of let it slip. But I have the November issue to hand and it contains the lovely news of the partial return of Brass Tacks. Mind you, I enjoy about fifty per cent of the "Science" letters but as the whole it is dry bread and no water!

I got a fella in the States to send me out three current issues of Ascending, one each for my two pals, and this same guy has sent me a copy of each issue from the time that you took it over, as that as far as I am concerned my time as O. K.

If you don't mind my rambling on, I would like to give you my impressions of your magazine. Van give us the best in illustrations, (and

a few of the worst) the biggest variety of artists, with Weiss and Doid waaaay out in front, with Marchbanks and Blodgett next, in that order. There is only one artist that is faulted by having his work in Astounding (don't all roll at once)—Thomson.

As most of the authors write to most of the subscription agents, I will refrain from saying that you have the best authors, but there is no doubt that they seem to offer you their best work. But don't think that this is the case with all of them. Talking of authors, why don't you "bring back" Richard Vaughan, Laurence Manning, and Gilmore and his Kurt-Carm-Adventures? Don't give us the old stuff about them not offering you any stories, but do the same "what-ever-it-was" that you did to the old summer—John Talbot. How about it? No talking out, give us a straight forward answer.

Eric Frank Russell is an up and coming sort of a writer, with a free swinging style and a dash of humor for good measure. I hope we get a sequel to "Doctor of Tomorrow". The best time story of all time was that "Thought Partner" of Harry Linder's, you know, when "T.C." were becoming back in '34.

Dr. E. R. Smith's "Galactic Patrol" starts off in the first three installments with enough material to dwarf all other of his galactical wanderings, and it is to be hoped that he can maintain the pace throughout. It is great stuff, and I hop it up.

The Blodgett boys have a soft spot with me, and they always seem to scribble a consistent form that never fails to leave me satisfied, even if it was not a super story.

I could ramble on for pages like this, and perhaps you, and maybe the other readers, are starting to yawn already, so I will cut the rest of this as short as possible.

I wish you would announce a few of the stories that you have on hand from time to time, and give us something to look forward to. O. K. you guys who want to be surprised when you buy the mag, but how about it then? Just number one or two each issue, huh?

It is a long time after the stir that Lovecraft's stories started, but I think that they were great. Anyone who says that John Russell Ferra's work is rubbish will receive one punch in the next mail. Too many of your readers claim this great, and inferentially when do we hear from him again?

The science articles are great, and I would like to know the reason why you definitely will not put out the quarterly, which is the dream of all Brave Tuckers.

Well Mr. Editor, and Gang, I hope I have not bored you too much, and if I have, you must pardon me as I really wanted to claim that M.I. letter to appear in Astounding since Street and Smith rejuvenated it. And to let honorable Editor know that there is a field as yet unexplored out here. And I hope to be able to buy the issue containing this letter, providing that the letter is up to the standard of beloved "Brave Tacker". Attention—Attention!—Ray S. Burdett, 80 Richmond Ave., Grey Lys, Auckland, W. I. New Zealand.

We can't drop Science Discussions since many want to discuss the science of the stories.

Dear Editor:

I have just finished reading your January issue and find it excellent.

"Crusade of Reasoners" was one of the best stories I have ever read since I started reading your book. "The Voice Out of Space" was a very good short story, although I have read some that are better. "Dead Knowledge" was a little too deep for me and I couldn't enjoy it very much. "Red Heritage" was a very fine and interesting story but not as good as the story "Crusade of Reasoners." "Galactic Patrol" is a

very fine serial. I did not like it at first but it has developed smoothly.

By all means keep Brave Tucks in your magazine. I do not care as much for Science Discussions and would rather have the space for Brave Tucks. This is my first letter and I hope that it is a somewhat lively Missy, West Portsmouth, New Hampshire.

But he's not the only one, at that.

Dear Mr. Campbell:

I've been going to write a long time and suddenly decided not to procrastinate any longer. This afternoon about 4:30 I obtained the January issue of the magazine, and now, at 7:30, I have finished all except Brave Tacks.

I was especially gratified to see a scientific article like Arthur McCann's in Science Discussions. I think the last five paragraphs show quite intelligent reasoning.

Probably, as a reader of the magazine, I am in a category by myself. I have only bought the magazine myself for about a year, but about a year ago a friend of mine loaned me copies of all issues going back to before Street & Smith took the magazine over. I must say that when that happened "your" magazine stepped out of the class of ordinary science-fiction. I think "Skyhawk of Valeron" is my favorite so far. "Galactic Patrol" is absorbing, however.

Personally I do not like those—shall we call them biological stories—such as the present "Pterodactylus Rejected". Perhaps there are those who do.

Math, chemistry and physics are my fields of interest. Especially electromagnetic waves. Might I say that in answering their riddles lies most of our future. We really know hardly anything about them.

Probably the main reason I like the magazine is because of the stimulus to my imagination. While reading it one night an idea came to me from apparently nowhere. If I become the scientist I hope to be (I'm trying to get the dough to go to college now) it will mean something really astounding. The principle is quite simple and entirely possible. I only wonder why it hasn't been thought of before.

Perhaps I ought to stop before you get tired reading.—Lester Hartwick, 805 Water St., San Mateo, Calif.

We did!

Dear Editor:

I spent one quarter-revolution of the chronometer (clock to you) looking for the two "science features" as advertised on the cover of the December issue. Probably like many others I failed. Perhaps you anticipated "the nineteenth is a series of science discussions", etc., by Campbell.

"City of the Scarlet Border" was greater than "Pact of Freedom and Fury" and that's saying something. Is it possible to have another one? Eric Frank Russell's "Mama" was a gem. A lower author might have made the same plot into a long affair, but Russell to three pages gives a tale that left me refreshed.

"Dark Eternity" read smoothly and held my interest but wasn't up to Ferra's standard. "Galactic Patrol" exceeds the "Skyhawk" series for interest. With every installment it has improved till now I can't wait for its continuation. "Spore Signal" was thought-provoking. "The Secret of the Rocks" presents a plausible variation of an old plot. "Angel in the Dust Bowl" was good, but I doubt truth of mountain-reading rain. You don't find mountains near Chicago but we get rain. "From the Vacuum of Space" and "The Time Contrarior" were raised above fair by surprise at the end. "The Mind Master" was spoiled by the fact that a moving picture used the plot first. "Spectral Adventure" — informative. — Mark Robinson, 650 Surf St., Chicago, Illinois.

VIBRATORY

by

Warner Van Lorne

PROFESSOR Robert Ernest smiled as the door closed behind him. He stood at the threshold of his dreams. Twenty years of experimenting had resulted in the machine he faced; every dream and every endeavor had been toward this moment.

When his wife died before he was thirty, he lost interest in the world. His mind turned completely to his professorship in engineering, and his hobby



The vanished pillar returned—grew solid—but there was a live creature of that other vibration world trapped in it—

of experimenting with the unknown.

His colleagues would have considered him impractical if they had known of his theories, but he kept them to himself. In his broad list of acquaintances and friends there was no confidant, no one he could trust with the dreams closest to his heart.

The room he stood in was barren and cold, yet to him it was beautiful. Even the dusty cement walls and rusty steel beams were attractive. His face glowed with the luster of youth. His shoulders were square and his chest thrown out. He was a new man!

It was worth all the effort and heart-break of the past years, the many times he had thrown away all equipment and started again at the beginning. This time he knew there was no mistake. For months he had checked and rechecked the apparatus, until each minute part was perfection.

When he was satisfied there could be no further improvement, it was ready to be tested.

Every spare minute was spent searching for a building that could be rented reasonably. There were many which might have answered the purpose, but they never quite met the requirements set up in his mind.

He was playing with vibration—such as he had never known before—and it required a solid structure to withstand the strain.

When he discovered an old factory that hadn't been occupied for the past ten years, his hopes mounted. It had exceptionally heavy beaming and foundation, built for the machinery that formerly filled the three floors. It was much larger than he required, but that made no difference.

The roof was in bad repair and some of the glass was broken, but it seemed to be in fairly solid condition. It was the type of structure that would stand forever unless it was torn down.

It was far enough from any habitation to guarantee safety beyond the grounds. He didn't know that there would be danger, but the possibility must always be considered. There was no inkling of the results that might be obtained by putting the forces to work. Everything beyond a certain point was pure speculation.

The more he examined the heavy construction, the happier he became. He wandered through the empty rooms as if they belonged to him. In his eyes even the dingy neglect disappeared and everything appeared as it might have when the building was new.

When he sought the owner, to rent a portion of the place for the summer months, the man laughed.

"I don't know what you want the building for, but as long as you don't run off with it you're welcome to use it. I'll never occupy it again, anyway. Blow it up, if you want to; it's simply junk now."

When the sedate professor was humming a popular air, as he entered his apartment house, the doorman forgot to speak. He had been employed by the house for over five years, and knew Professor Ernest well—or thought he did. But it was the first time in his experience that the man had shown any common, human feeling. He had always been the stiff, proper man who said "good evening" with just the same inflection in his voice.

AS HE appeared the next morning wearing a necktie with two colors in it, the man looked at him closely. There could only be one answer, the professor must be in love.

The doorman was again astounded at the bundles of heavy material that came from the professor's apartment. It seemed impossible that there was room to store it all. Several times he dropped hints about the contents of the carefully wrapped packages, but received no re-

sponse. At times they were so heavy that he could hardly handle them, and the professor had to help him load them into the car.

Slowly the equipment was sorted and assembled in the empty building. The machine that was taking form was peculiar in that there were no large sections. Every unit was so constructed that it could be handled and transported easily. There were parts as fine as the works of a small watch, while others were sectional beaming. Each part was marked, and fitted the one adjoining to perfection.

Nine years of effort had gone into the manufacture and assembling of the sections of the machine, and each had been tested to perform its individual task. Only the completed unit remained to be tested.

For eleven years before that parts had been tested and tried, to discard the failures. Twenty years of effort would be culminated in a few minutes of operation. But after working out the only possible way to obtain results through vibration, Robert Ernest was satisfied to invest his life savings in one grand stroke.

As he stood in the room, facing the completed apparatus, there was no question in his mind about its successful operation. He had taken no chances. Every part that had shown a possibility of failure had been replaced by one without weakness. He knew it was far superior in construction to anything of the type that had been attempted before. For the first time in his life he was satisfied with his own individual effort.

The dream of his school days had been followed carefully. He still remembered the day he had listened to the lecture on vibration and had decided to find out whether the theories on the subject were correct. The same theme had remained the driving force of his life, although it was over thirty years since

the seed of an idea was planted in his mind.

With his machine it was possible to create vibration on such a scale as had never been known. It would not be heavy vibration that would shake a structure, but it could be tuned to any key of the scale. It could be changed one hundredth of a tone to search out the key of any chosen subject. For the first time in history it would be possible to duplicate the vibrational cord of any object by mechanical means.

If necessary, the tone could be sliced into one hundred more changes—the original tone of one key becoming the total range of the board. After striking a note that brought response from the selected object, it could be varied in almost infinitesimal amounts, to search out the utmost vibration of the cord. It could be divided and divided again, until the change of tone, obtained within the machine, would be beyond detection by the human ear.

Then it could be amplified to almost unlimited volume—to shake the ground, or tear the surface of an eardrum without distortion. Men could be driven insane in a few minutes by amplifying a tone that grated on their nerve system.

Professor Ernest knew that the human race had been given protection by nature. It avoided accidents with vibration that might otherwise have taken place. The most dangerous notes were those which were considered discords, and man naturally did not use them.

IF any man approached while he was testing the machine, he would think a thousand demons had been turned loose to create as much discord as possible at the same time. In the scale of discords there had never been many experiments; it was the one remaining field that might have amazing results.

The room of the old factory, which stretched for three hundred feet with

bare cement walls and rusty iron beaming, appeared like the finest laboratory in Ernest's eyes. He glanced around with pride and pleasure. It was *his*, to do with as he pleased during the long summer vacation.

The machine had been standing, ready for use, for almost a month before the closing of the university. Each day the professor found time to run out and look it over carefully, to check and re-check every part. Since the machine was assembled, it was hard for him to keep his mind on the subject he was teaching. He was living in a dream.

The electric wiring in the huge building had been checked and tested, and small leaks in the roof had been repaired. Everything had been gone over to make it comfortable and practical for the experiment. Lights might be switched on in any part of the structure, and every power outlet was ready for use.

Only a small motor was required to operate the machine. It pumped air pressure into a small tank, and the air was used for power in the small parts. In this way the vibration of the motor was separate from the parts to be operated, and they were not disturbed by outside influence. It transferred the power efficiently, without any solid connection, through the apparatus.

Once assembled, the machine appeared like the keyboard of a giant organ, with a boxlike compartment—six feet wide, by nine feet in length—behind the controls. This was packed with parts from the smallest, taut wires to large metal tubing and wooden flutes. The whole thing stood about six feet high, with the keyboard halfway up from the floor. On the back side there were several small conelike amplifiers, which could send forth an unbelievable volume of sound.

As the professor's fingers ran over the keyboard, sound issued from the amplifiers. To him it was sweet music, but

to any one else it would have seemed like the most ear-splitting racket imaginable. He had to become accustomed to handling it before any attempt at a set result. Every small control must be mastered, until it became almost second nature to use them. One little mistake might offset hours of constant searching for a certain rhythmical strain.

As the days passed, Ernest spent more and more time at the strange keyboard. He reached the place where he could follow through a strain until it had grown to unbelievable peculiarity. Small metallic objects were made to vibrate before the amplifiers, until they almost shrieked from the strain. The professor had to cover his ears with heavy wrapping at times, to keep the sound from reaching his eardrums. Even then he turned away with a splitting headache.

Some of the nearest neighbors had been very much interested when Ernest moved his equipment into the deserted factory. They had come to peek into the broken windows, and some had even come to the door for a view of the new machine.

Their curiosity was not satisfied, although it appeared like some odd type of organ—until the first strains of discord rang through the empty floors. Then they were willing to stay away. "The professor has simply brought an organ out here to practice on—and from the noise, he certainly needs the practice."

NOW a bright glow had come into the face of Robert Ernest. Everything had developed just as he had planned. In constant testing the machine had shown set results, following the lines of his theory as forecast in his mind.

The day came when he was ready to try the great experiment. Every door and every window in the building was sealed carefully. He would take no chance on anyone wandering in when

the vibration was in force. It might have upsetting effects on the result, and might be almost fatal to the intruder.

A carefully insulated chair stood before the big keyboard. The mountings of soft rubber would absorb most of the numbing effect of higher vibration, yet there was a chance that it would affect him more than he thought. The human system would not respond to vibration the way any metal-constructed building would, and yet it might respond enough to upset his mind.

Before starting these experiments, he arranged for everything in case of sudden death. He left details of all experiments he would carry out, and designs of the machine used. If he brought on disaster, they would know how to avoid the same result again.

It had always been his dream that it would be possible to tear a metal bar apart with the vibration which fitted its peculiar rhythm—that each individual object contained its own vibrational cord, and if it could be duplicated by mechanical means, it would have an unique effect on its structure.

He believed that it might even pass through changes, resulting in strange new forces. Where the experiments would lead, or how they would end, was beyond his theory. He knew that he could obtain results that had never been accomplished before, and watch the new reaction take place.

He was going to attempt a lot. The small machine was expected to duplicate the tone of the huge building, setting up vibration throughout the structure. He didn't intend to carry it beyond that point, but simply test the theory that any object of any size could be shaken by the power created in a small motor.

As the sound increased in volume, Robert Ernest covered his ears carefully. The doors of the temporary room were thrown open, so he could see the length of the building—to the dingy windows at the far end. His equipment

was on the ground level, where it had been easier to close off a small section for the early experiments. The two floors above had no partitioning.

It was early morning when he sat down at the keyboard and tried the first strain of rhythm. When darkness fell he was still searching for the unknown key, but twice he had felt a slight sign of response in the structure. This narrowed the range of tone down slightly, and he set the machine within that cycle.

Three times more the building showed slight response, but nothing that would hold sufficiently long to carry through to the vibration of rhythm. At last he shut the machine down and turned away. He had his first mouthful of food in fifteen hours. Time had been forgotten while he delved into the unknown.

The following morning he started the machine again. The work of the day before had laid a foundation to start from. He had been able to leave the same setting under which there had been slight results the day before. The tone was only slightly different from a variation in temperature.

Knowing how the vibration would have to be changed to match even a small amount of dampness in the air, Ernest had been loath to leave it to the evening before. How it required hours to obtain the same result—to strike the same response in the building and vary it to search out the peculiar off-tone which would affect the structure with a true key.

AS vibration in the steelwork responded to a note of the machine, the professor transferred the range to within the small margin of the note. Then the tone was subdivided into almost one hundred separate changes. They were so slight that it required a change from the highest to the lowest tempo for the human ear to detect. The range between seemed identical.

Should the vast structure began to vibrate, but it seemed to come from one section. One beam, toward the far end of the floor, showed more quiver than any other section. As he switched the range slightly, Ernest watched that piece of steel almost two hundred feet from him.

Perhaps it just displayed more of the vibration than the rest of the beaming, yet it seemed to be alone in its steady shaking. The section of cement ceiling, surrounding the top, began to flake slightly, and suddenly a larger piece of the cement dropped to the floor.

Still the professor held that tone. The beam seemed to shiver as it absorbed the rhythm sent forth from the vibratory. The steel seemed to almost moan under the terrific strain, and beads of perspiration gathered on Ernest's forehead. For some unknown reason he felt afraid, but would not ease the pressure of his finger on the key which caused the disturbance.

The beam had reached its utmost vibration under that tone. A new tone, three keys higher, replaced it. Again the beam quivered and shook from the strain, but this time its action was greater than before.

Once again a different key was depressed on the vibratory scale and again the beam shook, but slightly less this time. For a long time the keys were switched back and forth, until the one which created the most action became a certainty. Then it was locked in place.

Once more the range of tone was changed, until the former tone of one key was divided into nearly one hundred. From the top to the bottom of the total keyboard there seemed to be no change to Ernest's human ear. Yet he knew that the vibratory was working properly, dividing just as accurately as it did before the tones had been divided the first time.

The change in the range of sound was shown by the action of the steel

beam. It vibrated so terrifically that it seemed impossible for it to stay in its moorings. The ceiling above was shaking so hard that a cloud of dust constantly rose from the falling pieces. The hard cement was being turned to powder under the strange effect of the sound.

As his fingers crept farther and farther along the keyboard, the professor stared in awe at the work created by his hand. Slowly the sound in the huge factory faded out. Nine keys in a row sent forth no audible sound. The machine was sending forth the same tones that it had earlier, but now they were cut to the finest possible degree.

Then one of the nine silent keys was pressed, the steel beam almost glowed. For a time it seemed to remain motionless from vibration of too high a tempo to be visible, then it slowly faded.

There was no danger any beam there!

The windows at the far end of the building were visible in an unbroken row, where a few minutes before they had been crossed to the steel upright.

For a long time the professor held the key rigid. His hand was cold, and numbness crept up his arm. The experiment had gone beyond the point that he could foretell the result.

The cement had ceased to fall in clouds of dust from the ceiling. Ernest nearly toppled from his chair at the sight! A perfectly round opening, about eighteen feet in diameter, appeared where the beam had stood. The cement of the floor above had disappeared with the beam!

FOR A time he sat still. Forces that he had never dreamed of had been brought into use. He slumped slightly, and from the vigor of a young man he looked twenty years older than he should. He had started with the firm idea that he could control the action of the vibratory.

There had been the possibility that

the building would be damaged slightly in the tests, but he had not realized it would only be a small section that was affected. It had taken several hours to vibrate the beam sufficiently to know that it was absorbing the total energy from the amplifiers. It would require days to accomplish the same result with the huge structure.

Vibration had to be built up to the capacity of the object to be affected. The small motor did not develop more than its rated power, but had to take the



*The pillar faded—
dimmed to nothing-
ness—and was gone!*

time to build up sufficient energy to obtain response.

Professor Robert Ernest sank lower in his chair. His theory, that perhaps the laws of physics might not hold true in this one instance, had been wrong from the beginning. It had seemed at first glance that they did not apply to vibrational effects.

Slowly his head lifted. His finger gradually eased the pressure from the key which had caused the strange action of the steel support and surrounding cement ceiling. It was inconceivable that vibration could cause such action—yet the invisibility of the pillar was before him.

For several minutes after releasing the pressure on the key there was no change in the vacant spot in the building. The professor's feet dragged as he walked slowly toward the spot where there should have been solids—yet there was nothing.

Then he stopped short. There was a hole in the foundation, as well as in the ceiling overhead. It was curved like a bowl and sunk about six feet below the surrounding level. The vibration in the pillar affected everything around it for a certain distance. The size of both openings were identical.

As his gaze wandered up through the opening, he saw the blunt end of the hissing steel beam hanging from the second-story ceiling. It appeared as if it had been sheared off about the same distance above the top of the pillar in the first story as the depth of the opening in the foundation.

There was vague uneasiness about the missing section, almost as if the empty space between the two openings was cloudy. As Ernest bent forward to peep closer at the hole in the floor, his head hit something solid!

It threw him off his feet, as if he had been shoved back by some fast-moving object! His forehead was burned

where it had made contact and for a moment he couldn't see. Everything turned in dizzy circles.

When his vision cleared, the beam had become a vague blur, and the cement was beginning to form in its original state. While he lay still to get his bearings, the professor realized that the supposedly sheared-off section of beam overhead had been supported by something tangible. Invisibility had done away with its appearance, but not with its support of the sections of the floor above.

There seemed to be no explanation for the effect on the empty air surrounding the pillar. That had become a solid and had nearly knocked him unconscious when he ran into it. It had absorbed the same vibration as the solid materials.

An axis was evidently created by the beam. Perhaps there had been formed a new existence for inanimate things, purely, by accident. It had made his head ache to follow the strange behavior of his experiment.

Having destroyed the pillar through some new form of power, it should have been gone. But, instead, it was returning to its original state. Even during its supposed disappearance something had replaced it, to keep the supports of the building intact.

THEN he sat up—An exclamation escaped his lips! Twice he rubbed his eyes, but each time he saw the same phenomenon.

There was a live creature being formed within the pillar!

There was a battle going on within the clear, tangible space around the beam! Some live thing was squirming and fighting the reformation of the steel in its original state. The metal was being bent out of shape by the creature! Ernest's hair stood to stand on end. He was not superstitious, but it was almost too much to stand. He couldn't

believe what he was watching!

He sank back with a sigh. The events of the last few moments had been too much to stand. He sank into untroubled oblivion.

It was an hour later when he awoke. He lay still for a few moments, trying to remember past events. He knew there was something that he *should* remember.

His mind jerked back at the sound of peculiar noises from near by. He

tion which was simply filled with air, he would have been free. But he had been in the part that represented the dissolved pillar, in whatever state of existence he came from. When the pillar solidified, it had to give and leave room for his limbs within its surface.

In the vibrational state the creature must have been more solid than the steel of the support. When the steel returned to the present form, by the



dared not turn his head for fear he would see what he remembered as a vague dream. When he did find strength enough to face the pillar again, it proved to be all too real.

A creature was hanging from the side of the metal by one leg and what might be taken for an arm! It was making odd noises, and trying to pull away from the grip of the metal.

Still the professor couldn't believe that it was true. The metal had formed around the two limbs of the creature, as if he were fused to it!

If he had been in the section of vibra-

tion of vibration, the creature had come with it—and was alive in the pillar!

It was covered with thick hair, of a bronze hue, and wore no sign of clothing. He might have been an ape of the jungle, except that his hands were enormous—with twelve fingers on the one which was free of the pillar. His foot had nine digits.

His arm and leg seemed to be of about the same length, and were both long in proportion to his body. But his general proportions were similar to those of a man. He would stand about nine feet

tall, and weigh about three hundred and fifty pounds.

The light was poor, but Ernest was able to see that his face was smooth and very pink. Suddenly he realized that he was watching an intelligent creature. The thing was motioning for aid to escape from the imprisoning metal!

He was trying desperately to tell the professor, through motions, exactly what was needed to free him from his uncomfortable position.

It was useless. Robert Ernest could not understand the sign language. There certainly was no human equipment which could cut a man free from heavy steel without serious physical injury, or else by a long, slow process. The man (as Ernest considered him) was trying to imply the use of equipment which was unknown to the professor.

The man watching the suffering of the other strung up to the side of the metal post through no blunder of his own tried desperately to think of some solution. The hairy man was above reach and, hanging as he was, must be suffering from lack of circulation and the strain on his limbs.

There was lumber outside the door of the factory and Ernest had an armful inside before he stopped to think. A few moments later he was busy with hammer and nails from his tool kit. At least he could build some support for the man's body, even if he couldn't free him from the beam.

From the appearance of his limbs where they entered the surface of the steel, they were not injured, but simply sealed tightly with the surface. While he worked, the professor's mind was busy.

There only seemed one possible way of freeing the man from the imprisoning metal—by re-creating the vibration which had enabled him to enter it in the first place. The scaffolding, for support of his body, would ease his suffer-

ing while the vibration was being built up to accomplish the result.

IF it was not for the time required to obtain the action, the professor would have started the vibratory without bothering with the lumber. But he knew that it might require an hour, or even three or four, to dissolve the material. It was impossible to judge the time required to build up the forces, as the vibratory had been affecting the beam for a long time before the proper combination was found.

Even the vibration of earlier experiments might have been building up the power, until it only required the right touch to accomplish the result.

The framework was light, but it supported the weight of the man safely. It was the first time Ernest had seen the man's features clearly, and now he marveled at the intelligence in his eyes.

Although representing a race of unknown people, from an unknown existence, he was certainly as far up the scale of knowledge as a human being of the civilized world.

The pink, oval face was refined and showed his suffering quite plainly. The professor felt that he had snatched a man from his native environment, without cause, to come into a strange existence under terrible circumstances.

There was no means of communication between the two men, yet a slight bond of understanding existed. The face of the alien man was enough like any human being's to eliminate any feeling of difference between their mentalities.

The professor warmed to a feeling of friendship when the stranger didn't appear to resent his situation. Instead, he seemed to understand that it was an experimental accident that had placed him in the predicament.

The scaffolding enabled him to be in a fairly comfortable position, and he tried to assure the professor that there was

no need to worry about the imprisonment of his limbs. When he smiled and shrugged his shoulders, as if the odd situation were of no importance, Ernest felt a little easier. He had been afraid it might result in permanent injury.

The ladder that he leaned against the post was uncomfortable to stand on, but it was the only means of getting close to the hairy man.

The stranger showed interest in everything about Ernest. His watch drew attention for many minutes, as the hands slowly crept around the dial.

Clothes appeared to be the greatest marvel. As he couldn't see any use for them, he shook his head in perplexion. To him they were a useless encumbrance which restricted movement.

The professor handed over one article after another from his pockets to be examined. At first he gave them to him one at a time, waiting for them to be returned before stretching forth another. Finally the man picked up the jackknife, fountain pen, and some coins which were lying on the boards beside him.

He was able to turn several things in his hand at the same time because of his twelve digits. They were used independently of each other, so that he could accomplish the same action with one hand, as if he had more than two hands to use. There was no thumb, but the fingers were of varying length. The longest toward the center of the row with the end digits was about the size of the professor's little fingers. The biggest was larger around than a man's thumb, and probably nine inches long.

The professor had been trying constantly to think of some plan whereby the hairy man could be freed from the imprisoning metal, yet he knew it was useless. Too much time would be required to cut through the huge girder with tools that would guarantee no injury to the embedded limbs.

SUPPORTS had to be put in place to keep the building from settling while the cutting was being done; even then there would be danger of accident. He had to give up all hope of a solution. The man would be returned to his native existence without his visit becoming known to the world.

The professor gave his watch to the man as a present. It had drawn his greatest admiration, and it meant a real gift to him. Then he turned away, to lead for the vibratory.

The sooner he was able to strike the vibration of the steel beam, the quicker the man would be back in his normal life.

The machine was not terribly heavy, and Robert Ernest wheeled it out to within thirty feet of where the hairy man was suspended. It seemed that the least he could do would be to keep the man company while he searched for the proper vibrational key.

Hour after hour the keys were pressed and changed without result. The same combinations that had caused the action before didn't show the slightest effect on the beam encasing the stranger.

Darkness came, and still the professor tried the combinations. The hairy man watched with interest. Several times, as he looked at the professor, he nodded. It appeared that he understood the operation of the vibratory. His eyes never left the keys for a moment, but followed the slightest movement of Ernest's fingers.

When he was so tired his eyes wouldn't stay open, the professor turned away. He found his strange friend sound asleep, and it relieved his mind.

Leaving the building silently, he returned a short time later with a meal for both of them. No one beyond the walls must know what had taken place within, and he dared not leave for long.

Going back to the car once more, he returned with two narrow mattresses,

and roused his friend to place one beneath him.

The man smiled at Ernest's interest in his comfort, and gripped his hand impulsively. From that time their friendship was more than just a chance meeting, and the time passed faster while the professor searched for the right vibration.

The night passed, and still the hairy man was bound to the post without chance of moving. Ernest's admiration knew no bounds. Whenever he approached with food, or simply for a few minutes of companionship, the man always had a smile of greeting. In friendship he was passing through.

Finally, after three fruitless days of searching the vibrations in the range that had brought the result before, the professor did away with every setting of the machine. He was starting at the beginning again, to search out the proper combination.

As he played the keys carefully, understanding of the change in vibration became clear. The beam was no longer intact! The fact that the man was partly contained within the surface might change the tone to almost the opposite end of the scale. If he had started at the beginning and searched for the combination on the full scale, the result might have been accomplished the first day.

WHEN many hours passed without result, another fear assailed the worn man. Perhaps the beam could no longer respond. Perhaps the flesh and blood of the man affected vibration so that it could no longer cause the same chain of results.

It was dusk, with over twelve hours of work behind, when the first sign of response appeared in the beam. Several times he tried keys one way and then the other, but there was only one note that had any effect. Even that key re-

quired almost two minutes to cause reaction.

Once again, as he laid in the first experiment, the tone was divided and the key with the greatest reaction singled out. Again it was divided, and again searched carefully.

Six times the scale was minimized, until there was no detectable difference in the full range of the board. It sounded like the same note, produced by any key that was depressed.

But Robert Ernest knew that the mechanical part of the vibratory was working perfectly and slicing the vibrations in almost atomic fineness.

Now the beam was showing signs of greater agitation, and the hairy man was perspiring from the quivering section of steel. Agony showed in his face from the metal cutting into the flesh of his limbs. The vibration was almost beyond endurance—but he smiled at the professor, and tried to hide his feelings!

When the proper cord was struck, the beam increased its quiver. The cement of the floor and ceiling joined it in shaking. The strange man was resting in untroubled sleep. He would not regain consciousness for many hours. It had been more than even his marvelous physique could stand.

After fastening the key in place, there was nothing more he could do, so the professor busied himself writing notes on the complete experiment. Every detail was set forth, including all settings of the machine, so an engineer could follow them through.

He was tired, and could hardly keep his eyes open. The paper and ink blurred in his vision, leaving many mistakes. But he kept doggedly at the task until it was finished. At length he turned away, with a scribbled last word.

"I'm going to try and enter the sphere of vibration now. It just occurred to me that I owe it to the strange man to return to his world. They will be inter-

steel in me as I am in him—and we are friends."

"Perhaps, to you, it seems strange that we could become friends when we can't even converse. But I admire him for his uncomplaining nature, while he appreciates what little I have been able to do for his comfort.

"I may be able to care for him when he arrives back where he came from—if we reach the same place! In his physical condition, from the terrible wracking of vibration, he will need care to survive. It is my duty to accompany him through the strange wall of force, and do all in my power to reimburse him for the suffering I have caused.

"Perhaps I may return to this world someday, but from the effect of the vibratory, it is better to leave my discovery unknown to the world.

"Some things are better left in an unknown stage. My theory of vibration has proven true beyond my fondest dreams, yet I would not have gone on it if I had known the result.

"Please! Whoever discovers my notes, will you destroy my machine? If it proves a good thing to carry on communication between the two vibrational stages, I will return. Otherwise, do not make public any of this information, until after the vibratory is destroyed."

I waited many years before writing the story contained in the penciled notes left by the professor, but I finally decided to destroy his machine. The only proof that I have of the strange story is contained in the steel beam that remained bulged as it was described.

I must believe—I am the owner of "the building!"

Polarized Light—

You know this familiar demonstration of the curious phenomenon of polarized light, and polarizing crystals—

BUT—that is only plane-polarized light! Do you know the effects and properties of circularly polarized light? As truly polarized as plane-polarized—but passing through the polarizing screens?

In the APRIL ASTOUNDING SCIENCE-FICTION

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FLAREBACK

by

Kent Casey



'It was the professor's party—and the professor had a nice time, anyway!

SERGEANT JOHN WEST of the Space Patrol sat gloomily on the bench in the orderly room and cast a fuddled mental eye over his situation. What a bright boy he had been! So cocksure, with the half-baked

physics while in college! He was going to be a great space-roamer, he was! Free-lancing all over the galaxy and bringing home vast wealth. Oh yeah? And just as soon as he was ready to go, and had been prospecting long enough to miss completely any chance

An interplanetary story by a new author with a new style—

of getting a real start at anything else, along comes this war with Uranus. In spite of his space experience there was no commission for John West. He didn't know enough of this new stuff to qualify.

"Just a space bum, that's what I am. And now that the lanes are closed for duration of the war even bums like me can't roam around. Free lance, huh? 'Aye, aye, Sir! Sergeant West reporting for orderly duty, Sir! Phooey! I can't even get to the front, but have to stick around here running errands for Colonel Brumby, the old Miss Nancy! Sit here twiddling my thumbs and opening doors for whiskery little goats like that Dutchman who just came in. 'I'll be! I have to convoy him safe home and make sure no big, bad Uranians bite him after he's through chewing the fat with the Colonel. Wotta life, wotta life!'"

The buzzer overhead sounded crisply and Sergeant West rose disgustedly. "Didn't I tell you? He's sobbed out his story to the Colonel, and now I'll have to nursemaid him home somewhere back of beyond. What'll you bet I'm late for chow getting back?"

However, grouch or no grouch, John West was a good soldier. His back was as rigid as a ramrod and his face an expressionless mask as he clicked his heels and saluted before the Colonel's desk. The "whiskery little goat" lolled back in a huge armchair, patting his finger tips together. His pale blue eyes ran appreciatively up and down West's six-foot-three.

"This is your man, Dartog," the Colonel said, then turned to West. "Sergeant, this is Dr. von Theil. He has shown me some rather interesting data for which he desires confirmation. The experiments can be tried only out in space, and since the doctor is unable to

fly himself, he has requested a small ship and a pilot. His apparatus has been installed in that small Bruyere despatch-boat in Hangar Nine. You will fly for him. You are under his orders until your return, and will obey them as you would my own. If some of them seem unorthodox to you, you are not to comment. After your return you are not to talk, for the experiment is not for public knowledge. Understand?"

"Yes, sir," answered West. "I am to fly under the gentleman's orders and say nothing, Sir."

"Correct," Colonel Brumby nodded. "And that also applies to orders regarding the technical management of the ship. That is all. Dr. von Theil will tell you when he wants you."

WEST SALUTED, spun on his heel and went back to the lurch in the orderly room. Well, the old goat wasn't scared anyhow. He wasn't one of those that wanted a nursemaid. "Obey and keep my trap shut, huh? O. K. 'Technical management of the ship—' Must be he's one of these birds with a notion about space maneuvering. O. K.! I'll maneuver him. It won't be the first time I've shimmied around space in a safety belt after some bright boy has burnt out his generator or bumped an asteroid. Better than sitting on this damn bench, anyhow."

The Colonel's door opened, and the little scientist—white sideburns wagging as he said good-by—bowed himself out into the orderly room. West stood up at attention. Dr. von Theil looked at him for a moment with a cherubic smile on his pink face. "Hm-m-hm, Sergeant!" he chuckled. "I ask for a flier and a ship." The ship, the Colonel says, is just so-so, or he wouldn't let me play with it. But I think he has given me

kets of pilot. What you eat, to grow like that, man?"

Sergeant West's poker face showed no trace of the ire this question aroused. A fresh guy, huh? But his huge brown hand snapped to his helmet-brim and his face moved no muscles as he replied briskly, "Mush and milk, Sir!"

"Hm-m-m!" the doctor cooed again. "So do I. Maybe it don't work so well with Dutchmen. Anyhow—when can we start, eh?"

West swung his field-kit from its hook on the wall and wriggled his great shoulders through the straps. "Now, Sir," he replied. "There are spacesuits and canned rations in the ship already."

"Fine!" clucked the little scientist, picked up his briefcase and started for the door almost trotting. "Let's go. I hope all the spacesuits aren't made to fit you. I would be—er—surrounded, would you say?"

"Your baggage, Sir?" West asked, a bit taken aback by this abruptness. Why, the little guy acted like a Marine—evidently expected somebody else to drag his duffel for him. Oh well—

"Baggage?" the blue eyes twinkled and a pudgy hand waved the briefcase. "You got yours on your back, I got mine here. Why travel with a lot of foolishness?" He started for the hangar, trotting at a rate which made even John's long legs stretch their stride to keep up.

THERE WERE no formalities about the start. The little Bruyere, barely thirty feet long, lay on the ramp already. West cast a keen eye over her for strange apparatus. But could spy nothing but a tiny, platinumlike spiderweb on the ship's nose. In the charthouse, just ahead of the controls where the observer's chair was located, the chartboard had been cleaved away and there had been mounted a small cabinet with dials and a little handwheel. From the leads running to it, this cabinet was evidently

hooked up to the power circuit. That was all.

"I see," West said to himself. "Another so-called foolproof steering gear that will turn the ship around on a dime by wiggling the pilot's eyebrows. O. K.! His little legs will snap quicker than mine when Old Man Tolson gets hold. Boy! Will I ever forget that guy who spun the old Barralong in her own length while he was going twice light-speed!"

Nothing of this soliloquy was discernible in his voice as the doors of the air lock slammed shut and he turned to the doctor. "Any orders about taking off, Sir?" he asked.

Dr. von Theil shook his head. "No," he smiled. "You do that. I don't understand all those thungum-a-callems. I never was in a spaceship before. You just go ahead and get away out somewhere with nothing around. Then you stop and I tell you some more."

"Aye aye, Sir!" was West's audible reply. As he turned his back and settled his long legs into the pilot's seat. Oh, oh! He don't understand how to run one, but he can figure a new way to steer one, huh? Never been out before, huh? O. K., boy—you brought it on yourself! But how the heck did you talk over the Colonel?

Automatically, from long practice, he tested his circuits and jiggled his fuel gauge to determine its sensitiveness and accuracy, spun his generator over, and eased the repeller throttle open. There was a hiss and a cloud of fine dust thrown up by the blast from the tiny ship's bottom. So rapid was the take-off that the roar of the discharge was left behind. West's malevolent eye twinkled as the terrific acceleration flattened the little man in his seat, and he waited for an excited protest. Instead, as the motion became easier, the little doctor straightened himself up and turned a beaming face toward his pilot. "Oof!" he said breathlessly. "You got no speed.

laws up here, I guess. Next time you have to do that, I get some sense and sit more tight. Poof! What a wallop she got, this little boat!"

"Sorry, Sir," said Sergeant West. "I'm used to flying big stuff and didn't realize this baby would hop. I'll choke the gun a bit next time." But to himself he admitted that the funny little robot seemed to be a good sportsman at least. That would help when the crack-up came—he wouldn't have to coddle a whiner.

FOR SOME HOURS the little ship whizzed into space and void. Far ahead an occasional light could be seen as some distant sun flashed in the visor-screen. Behind there was only dense and impenetrable space blackness, for not even light-rays could keep pace with the Bruyere. "Where we are now?" suddenly asked the doctor.

"Just about crossing Neptune's orbit," answered West. "Where you want to go?"

"Hm-m-m, so far? Better stop now a while, I guess. Nothing around here to bump?" was the reply.

Sergeant West switched off his power and began to tune his micro-repellers slowly. "No, Sir," he said. "Of course, we're still in the Solar System and there's a bit of a drag on us from the planets; but I'm neutralizing that and we can hang right here if you wish."

"No," said Dr. von Theil. "I stretch myself a bit and you tell me how this ship works."

West at once fell into his Sunday-visitor routine. He had long ago given up trying to explain the workings of a spaceship to laymen, and had devised a satisfying account of why they flew and how which sounded well in a tourist's diary, but which told absolutely nothing regarding either the ship or her mechanism. Had to be polite—but the Colonel was hell on secrecy. Besides, what was

the use trying to make them understand?

He was interrupted by a high crow of laughter. Dr. von Theil was doubled over with mirth. "Ho, ho, ho!" he roared. "You are so funny! You say that on the radio and you make some money, eh? I don't mean that, big man. I mean—well, suppose you get into the thick asteroids and you get too close. Why don't you bump one, eh?"

"Oh," West was surprised into frankness. "Why, the neutron screen holds 'em off until I can get out of there. Of course, if I get too close, it's apt to be ticklish. Some of those pebbles are big enough to pull like a tractor-ray. I give the asteroids the go-by when I can. The little ones are just as bad—the ship pulls them, your screen takes an awful beating and then the shops report you for damaging government property and wasting fuel."

"Ah, yes, neutrons—I see. I wondered about that. Now, this screen—you got it on tight or you can turn it off, I guess? You don't keep it to land, do you?"

"No," West shook his head. "If you kept it turned on, you'd just bounce around and never land till your power gave out. Here's the screen control. You can shut it off, or you can make it as dense as you please. When it's on full power, not even a space-bomb could get within half a mile of the ship. It'd blow as soon as it reached the screen."

"Fine!" cried the doctor. "Now you turn her around and you go to the Asteroid Belt. Where it is nice and thick and there are some big ones—pebbles, you call 'em?"

For once West's poker face was jarred, but the Colonel's voice still sounded in his ears. Sergeants were paid when they obeyed orders and court-martialed when they didn't. But—to test a new kind of steering-gear in the Asteroid Belt!

SERGEANT WEST'S military vocabulary failed him. "O. K., Doc," he said, most unprofessionally. "It's your party. I hope you left instructions how to notify the widow," and he again cut in his rockets.

The little man again roared with laughter. "No need for that," he chuckled. "The widow—she is my landlady. If I don't come back by Friday to pay my rent, she give my room to somebody else and forget all about me."

What could a guy do with a dumb clock like that in charge? Like most chronic adventurers, West was brave enough for two in emergency. But he

I'll say they're unorthodox! But for a long time Sergeant West refrained from comment.

The little ship drifted and the visor-screen soon grew dotted with images of asteroids, little and big. Finally West could stand it no longer. He jerked a large brown thumb toward the porthole.

"Doc," he said, "we're drifting less than a hundred miles from those pebbles and they're bad news to mix up with. Don't you know it, or have you just gone nuts?"

"I hope not," smiled the scientist. "Now you can cut out the neutron shield, son!"



could see no sense in hunting trouble just for the thrill of it. It might be fun for the cuckoo little doctor, but it was just a headache for him. Even this little jacket would be a handful to keep on her course once into the Asteroids "where it is nice and thick!" The Colonel must have been willing to expend an orderly just to get rid of this crank!

As the Asteroids drew nearer, the doctor's conduct became more and more inexplicable. "Shut off the power and drift a bit," he ordered.

After a long stare West obeyed. After all—what was the use? Of course, he might take a poke at the little guy and take him back to the nut house he escaped from, but that would be bad news when he faced the Colonel. "If some of his orders seem unorthodox, you are not to comment," the Colonel had said. Boy,

This time West's outward imperturbability gave away completely. His jaw dropped and he started to speak, but Dr. von Theil spoke again. "Cut the screen, Mister, please—and quick. Pretty soon we are too close."

Just in time Sergeant West had a vision of the Colonel's face and he choked back his reply. "Too close now, if you ask me!" he muttered. But he shrugged and pulled the switch. To cut both rockets and pull in the shield right on the edge of the Asteroid Belt! Not even the Colonel could have imagined the little squirt would do that! To leave the ship without steerage-way to avoid the darnicks or armor to withstand the impact of strays was one swell way to commit suicide. Gave you plenty of time to think over your past life, too. In defiance of regulations, John fished

out a cigarette, lighted it and leaned back against the bulkhead. O. K.! It's the professor's party!

IF HE KNEW he was inviting sudden death the fact seemed not to worry him. He was looking into his small television screen and slowly turning the handwheel just below it. There were crosswires like those of a gunsight on the screen. Centered on the intersection of the wires was one of the largest of the asteroids flashing by too close for comfort. Had John been able to see outside the ship he would have noted that as the little wheel turned under the professor's hand, the small, cup-shaped web of fine platinum wires mounted on the nose of the ship swung so that its axis pointed at the asteroid centered on the screen. Dr. von Theil touched a button on the lab of his control wheel.

"Fine! Good! Let's go home, Sergeant!"

West shook his head violently and dug his fists into his eyes in an effort to clear the blinding effect of the flash. The asteroid had vanished in one tremendous, blue-white spark. The Sergeant had been looking directly at it when it exploded. Good grief! What has the little runt got in that box of his? As soon as he could see, the Sergeant slumped back into his chair, cut in the neutron shield and started his rockets. Then he stiffened, swore, and began throwing switches on the control-board in and out.

"Visor-screen's blooey. Your little show must have burnt it out. Doc, I hope I can fly blind as well as I think I can." He pulled one more switch and then gave up.

"If you can fly blind as well as you can express your feelings," Von Theil said dryly, "I guess we get home. They learn to swear better since I left the University."

West looked quickly at the old man. There was an impish twinkle far back

under the frosty eyebrows. Dr. von Theil evidently was very pleased with himself and with the Universe.

West thought, "He's dumber than a Martian monkey, or else he's got more innards than a platoon of Guards. And he don't look so dumb at that."

The Sergeant had not underestimated the difficulties of flying blind from where they were. The Asteroid Belt had to be crossed to return to Earth, and—thanks to the Doc's "unorthodox orders"—crossed at a place where it was "nice and thick." With only the sightports to depend upon, West could not see all around the ship, and only by the jerk and crash of approaching "pebbles" could he even guess what was behind or on either side of him. The little ship was yanked violently off her course time after time. Sweat was pouring off West's face and his brawny arms were numb by the time they finally fought through the Belt and could straighten out. Only then did the doctor speak.

"My!" he ejaculated. "A good thing, I guess, that the Colonel gave me such a big man to fly for me. Man, you must be strong as an elephant!"

"Humph!" John grunted. Wasn't that nice, now? He got the ship into a mess, blows the visors, and then says, "Ooh, strong man!" Never again with you, runt! You play too rough for me. Still, darn it, what *did* he do to that asteroid? Boy, am I tired! I wonder—secrecy or no secrecy. I've got to rest and get some chow.

HE TURNED to Von Theil. "Doc, I'm all in. If you're in no hurry, there's a place on Mars we can stop and rest a bit. Don't tell the Colonel I took you there, though. It's a secret cache for the war fleet—so damn secret there isn't even a guard there, and the hangar and storehouse are dug out of the hill. Can't be seen from outside at all. We can eat and get another visor-screen, so I can take a clearer course home."

"I think you need some rest, too," the doctor agreed. "I guess you think I'm nuts, eh? I should have got inside that Belt before I send you looking for pebbles. Then we don't have so much trouble. I'm sorry."

"Thanks, Doc," West grinned. "You're not a bad guy after all. If you've never been out before you couldn't have known what it was like." He turned the ship toward Mars and not long afterward dropped gently into a small valley near the Martian ice-cap and ran her into what seemed a natural cave. Because of the broken television, he had not seen the long, silent craft with a strange crimson mark on her bow which, running without lights, had trailed them from the Belt to the lonely outpost station.

Sergeant West waited until he had started a fire and had put a generous supply of "iron rations" on to boil. "You can eat 'em just so," he said, "but they stick to your ribs better when you make soup of 'em. But Doc, can I ask some questions?"

Von Theil grinned. "Why not, Sergeant? Maybe I can't answer so well as you did, though."

West lit a cigarette and carefully snapped the match between his fingers. "I prospected for years before I came into the Patrol," he began, "and this is my fifth hitch in the Service. I worked the first disintegrator-ray the Patrol ever used. Last year I saw demonstrations of the Morrell ray. At one time or another I've seen everything between. But I never saw or heard of anything that could have rubbed that asteroid out the way your dingus did this afternoon. Maybe the Morrell could if you got enough power, but no ship made could carry a big enough generator. How did you do it?"

"Easy," said the scientist. "Ever hear of Dirac?"

"The big shot back in Washington?"

"No, one of his ancestors. P. A. M.

Dirac was a physicist back in the first half of the Twentieth Century. He put out a hypothesis that there is infinite density in space of electrons in negative energy states. As long as they stay in negative energy states you can't detect them. Now and then one of them gets kicked upstairs into a positive state and then you get an ordinary electron. That leaves a 'hole' in the 'infinite density of electrons'—foolish as that may sound—and that hole is what we call a positron. You can't see black letters on black paper. So, You can't detect negative-energy electrons in everything because everything is negative-energy electrons. I—let me see—I know what I mean but I don't say it."

SERGEANT WEST grinned. "You got something that time, Doc."

The little Dutchman chuckled. "Maybe I get it yet. Look—what I mean is you can't see black if everything is black. So, You can't detect negative-energy electrons against a background of negative-energy electrons. We take our black paper for a minute. If I put a piece of hexanite on it—pouf—and it gives a-hole. Now I can see two things—the hole, because it isn't like the rest of the paper and the pieces because they aren't in the paper any more."

"Hm-m-m—maybe you and hexanite could do it to a piece of paper, but— And when I went to school, electrons were negative anyway. Now you say that we can detect only the positive electrons."

"No. No, electrons are negative but — Look, not positive *electric* I mean, but positive energy-state. You take some water, and if it is high up above the sea it has positive energy. You make it turn a turbine. But if the water is at the bottom of the ocean it has negative energy. You must pump it to bring it to the surface. Right?"

"Yes. So—" West looked at the little man doubtfully.

"Like my hexanite—like my water pump—a sudden explosion of energy will pump some of those negative-energy electrons up to positive-energy states.

"Cosmic rays do that. Then—pouf, and we have an electron, and a hole where the electron was—what we call a positron. An electron-positron pair—always together you see—and a quantum of energy is used up.

"That little wire cup of mine just focuses a sort of ray—just me knows it—which has the property of creating those electron-positron pairs in huge numbers—oh, lots of 'em. All at once. Now when it hit that pebble, some of those electrons were right in the middle of an atom, and some of those positrons were right in the middle of an atom. And the atoms didn't like that and the particles didn't like it. But the atoms didn't like it more, because they were unstable. Well, of course the rock exploded—pouf!"

"To put it mildly," agreed West, "pouf. It still sounds screwy to me, but it did work—oh, oh! We got company!" He jumped to the window and looked at the long black ship settling to the ground outside, and whirled toward the passage to the hangar, dragging Von Theil with him.

"That ship's got the red death's-head on her nose, Doc! We've got to get out of here—fast!" He started running down the corridor, to the accompaniment of protesting gasps from the scientist. But West was too busy to listen. He was softly and steadily swearing at his superior officers. "That lop-eared jackass of a Colonel ought to have known better. Should have had a company quartered here to guard this fleet junk. 'Secrecy,' the dope says! The Uranians have sure spilled his secrecy now!" Then aloud: "Doc, when we get into the ship, I'm going to come out of the hangar like a bat out of hell and try to ram that baby. It's the only chance!"

But the two never reached the little Bruyere, for as West flung open the massive hangar door a swarm of Uranians ran into the mouth of the cave.

John had time to use his pistol twice before a force-beam from a Uranian's gun hurled him back into the corridor and crashed him against the wall.

AS HE FELL, stunned, Von Theil hastily slammed the flameproof door and secured it, ran back into the house making sure that all windows and doors were sealed. Only then did he return to the unconscious Sergeant, and with much puffing and blowing, managed to drag him back into the living quarters and get him onto a couch. He carefully examined the stunned man from head to foot, then breathed a long sigh of relief. "Nothing broke," he chuckled. "That is fine. Just a lot of shock from that force-beam. Well, I think he better not wake up too quick. The shock will disappear quicker if he don't. Hm-m-m—I guess they got a medicine cabinet here somewhere."

A brief search discovered the small drug cupboard for which he sought. "Hm-m-m—peristol; no, that is too drastic. Mangarol—that is it! I will let him sleep just about one hour. By then, I guess they will be gone. My! This big fellow thinks he can lick twenty Uranians with their fifteen-times-Earth muscles! Better he stay here a while." He moistened the stopper of the flask and waved it under John's nose. The Sergeant stirred slightly, and his breathing became more normal as he passed into a deep sleep. The doctor lit a long thin cigar and sat down to wait.

An hour later, Sergeant West stirred, blinked, and sat up groggily. "What the—?" he mumbled.

Von Theil held up a warning finger. "Sssh!" he whispered. "They think they got you and then don't know about me. Pretty soon they go."

"But they mustn't go—they'll spill the news about this cache and ambush some of our ships here——" West tried to rise, but the effects of the drug made his legs buckle under him. "What happened to me?" he gasped weakly.

"Me," said the doctor, "I doped you."

"You what?"

"Doped you. In another hour you be all right, but then they will have gone. They knocked you out, but if you come to too quickly, then you try to fight some more. Foolish! You can't lick all those Uranians."

West glared at him angrily but helplessly.

Doped by that little runt with the safety of the Fleet depending on him! The dirty double-crosser—— "Say! Lookit, Doc, did you tip those mugs off to this voyage? How did they find this place?"

"They followed us in," said Von Theil quietly. "I saw them spy us while we were drifting outside the Belt. Then they trailed after us. Their pilot don't steer so good as you."

"And you let me lead 'em right to this place after I told you it was a secret? You——"

"It is all right," soothed the scientist. "They don't give a damn about this place. They don't know it is a storehouse, I think—just a hangar. They saw me burn that pebble and came to get my gadget. They got it now, and I think they must have it installed on their ship by now and—yes, there they go!"

AS THE long black ship swooped up into the sky, he opened a window and pointed. "See, they got my cup on their nose. They must be pretty good mechanics to figure it so quick."

The Sergeant tottered across the room, and seizing the little man by the shoulders began to shake him. "You ass!" he almost shrieked. "You doped me and let them get that disintegrator off yours and you stand there grinning!

You little louse, you're a spy for the Uranians! Oh, if I can't turn you over to the Colonel, I'll take you apart myself!"

"Easy, easy!" Von Theil gasped. "Sure, take me to the Colonel, I'd like that a lot. But now, let me down. You are too rough."

"I'll get you there all right, you little crook! Though I suppose they've wrecked the ship."

"No, they don't waste time on your little ship," the doctor answered. "Why? They got my ray, so they just install it in their ship and they are going to turn it on us down here. Then, they think, pouf! like the asteroid."

John was still weak and dizzy and his outburst had left him clinging to the window-ledge for support. "And you think it's funny, huh?"

"You bet it is funny," agreed Von Theil. "See, they got the cup trained on us now. Look and see some fun."

"You're not a spy, you're just nuts! Fun to be rubbed out like—— Jumping Jeppers, what happened?" for surrounding the nose of the Uranian ship there flared a huge blue-white spark. With her forward third disintegrated, the gaping hull lurched forward, then was caught and crushed as with a thundering roar the shattered air crashed together and their warship clattered to the ground in fragments.

Dr. von Theil threw back his head and again crowed with laughter. "Ho, ho, ho!" he roared. "I thought they would be dumb. They saw my ray work, but they couldn't explain it any more than you! They were still in the atmosphere when they shoot, with matter all around. Why do you think I made you cut the neutron screen before I explode that pebble, eh?"

With round eyes in which comprehension slowly dawned, West stared at the little runt. "Well, fry my hide!" he finally ejaculated. "Of course! Your ray works when it hits matter, and it

would have exploded the shield and us before—it reached the rock. And—it exploded the air ahead of the Uranians instead of coming down here. You wanted nothing but empty space between you and the target!"

"You got it, boy! Now you see why I think it funny they should shoot at us, eh?"

"And I thought you were a dumb crook! But, Doc, why did you make me cut out the rockets, too? It scared the daylight out of me to do it."

"I don't know how hard the explosion will kick," replied the doctor, "so I think better the ship is free and loose if she gets pushed by it, see?"

"I see, Doc, you're a great little guy with more nerve than anybody I ever saw. I apologize. Now let's get to the ship and go home."

"No!" answered the little man. "You haven't got that rest yet. You need a night's sleep. Besides, I haven't used any of my baggage."

"Your baggage? Oh, that briefcase? Why, what's that got to do with the price of beans?"

"You need a rest and I am tired myself. I am not used to all this hopping around. You sit down and I get my baggage." He carefully set the plump briefcase on the table and opened it.

"Brandy," he said, setting one bottle on the table. "Whisky—good Scotch, that is. Kirschwasser. That is my baggage. I never carry foolishness when I travel."

John heaved a long sigh and settled into a chair. "Doc," he said, "you are the berries. Next time you want a pilot, I'll come running. Here's how!"

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EYE of the PAST

by

Eando Binder



In the world outside, the red ships of the Invader destroyed civilization—here, goms in water, revealed forgotten things—

ONE would almost credit Fate with being a diabolical fiend, reviewing the events of that half-century from 1940 to 1990. 1940 to 1990 had seen the most catastrophic warfare known to the history of Earth. A war of science.

Namelessly powerful weapons had been developed with which divided mankind had scourged itself. For twenty

years the frightful flames and demolitions spawned by a great science had decimated populations, destroyed cities, and ravished every community of its best and dearest. Blood soaked the world from end to end.

The fever of hatred burned till mankind lay exhausted, betrayed by its science. The inevitable result had been peace without victory for both factions.

Civilization licked its deep wounds after 1900, and rebuilt itself painfully.

Then had come a complete revulsion of feeling. The doctrines of pacifism swept over the world with almost the violence war had. Determined that such senseless holocaust should never again occur, war had been declared outlaw, and made outlaw. The world had disarmed, completely and almost vengefully. An International Pacifist Congress, given full power, denuded Earth of every warlike instrument. And of even the plans and formulae.

The process was so thorough that by 1900 the construction of a single cannon of any size would have required a complete new set of blue prints. Linked into a federation of amicable nations of every color and creed, the world looked back upon the folly of war and rejoiced that it had been ended.

Then, in 1991, came the alien invasion!

Disarmed, helpless, unprotected, Earth lay open to the interplanetary raiders who came without warning. Not a gun to lift against them. Not the smallest weapon with which to oppose. No armed airship to soar at the enemy's throat. No armored battleship to defend important coastal cities. No single body of trained, armed troops to resist attack.

Cosmic irony!

All through the month of May, 1991, definite reports were received in important news centers that mysterious red ships had been sighted all over the world. It was not only a puzzle as to whose ships they were, but how they flew. Wingless and silent, their torpedo shapes strangely defied gravitation. Such ships had never before been seen on Earth.

During May they had done nothing more than hover over various cities for a few minutes, hanging motionless as no normal airship should. When air patrol police had approached, they had

straked away at an amazing velocity, generally rising to the stratosphere. The much-discussed scarlet ships were sometimes sighted by the passengers of strato-liners, crossing the ocean.

Gradually a tension grew over Earth. To each city and nation it looked like nothing more than some enemy taking observations. Yet war was outlawed. Peace and peaceful relations had spread over the world like a soft blanket. What did it mean?

When a dozen of the red ships appeared over Paris in late May and without warning rared that city to the ground with a mysterious ray in a short, three days, the world wept. The bubble of peace had been destroyed. There would be war again. But what cowardly, evil nation had done this atrocity?

The nation across the Rhine became the focal point. Buried hatreds flamed anew. A harsh message of inquiry went from nation to nation. Denial only increased suspicion. Germany had about been branded with the deed when—

Berlin was burned into the ground! And London, Moscow, Rome, Vienna, Stockholm, Madrid, Constantinople and Warsaw—all in a short month!

Then, obviously emboldened by Earth's utter lack of defence, the enemy ships split into three factions which attacked Europe, Asia and America simultaneously.

Against the frightful menace that had suddenly appeared from nowhere, the world lay stunned. But not for long. There were no weapons with which to fight back, but Earth would rear. Steel mills began turning out gun barrels. Nitrate plants changed from fertilizers to explosives. The best engineers started designing weapons of every grade and size.

With a will, all the world fell to the task. Every one did his or her part in the great project. Every one, that is, except young Professor Harvey Carmichael—

SKIPTING a small town, the powerful car followed a macadam road toward the coast. Young Professor Harvey Carmichael had just escaped from Boston, where officials of the International League—Earth's ruling body—had conscripted him for their cannon factory. A bitter smile touched his lips as he drove through the night. He was thinking of the scene some hours earlier when his fiancée, Tanya Maxwell, had branded him as an egomaniac, anarchist, and several other things, and thrown his ring across the room. He had tried to explain, but she had not given him a chance to finish. He shrugged, but the bitter smile did not leave his grim lips.

A half hour later a grove of trees loomed out of the darkness. His headlights linnell a rambling old house among them, and the waters of the Atlantic just beyond. His summer retreat, presumably for vacationing, but with its basement completely outfitted as a laboratory. He had done some of his best work here, unmolested.

It was the ideal place now for his further work. The IL agents would never trace him here. Only Tanya Maxwell knew of its location. And at that thought a worried frown creased his forehead as he put the car away, and carried his two suitcases inside the house. Would Tanya, in a mistaken notion of patriotic duty, betray him? He would have to be prepared for it.

Dust lay over everything as he made his way to a bedroom and unpacked his clothing from one suitcase. He debated whether to phone the near-by village for his usual Negro houseboy, but decided against it. It would be best for him to be alone in this.

In a few more minutes he was down in the basement with the second grip. The lights revealed a large worktable in the center, shelves at the sides loaded with paraphernalia and supplies. At the back, dynamo, transformer and several large vacuum tubes designed to produce

several varieties of subatomic artillery. A large, complete television-outfit, with a five-foot screen, occupied the space opposite the table.

With reverent care, Carmichael unpacked the apparatus he had brought along from the city. He let out his breath in a deep sigh when he saw that nothing had been damaged. He set it on the worktable and clamped it rigidly to a stand.

To the casual eye it was a hybrid creation. But the trained scientific eye would center first on the overhanging Crooke's tube, trace the cathode radiation to a cuplike target of platinum; note the adjacent electromagnet and below the crystal resonator. The scientist would immediately know it was meant to explore atomic phenomena. He might even suspect it was delicate enough to probe into subatomic depths. But he would never guess what it was really meant to do—wrest from the atom one of its most treasured secrets.

But Carmichael had not quite succeeded yet. He knew by theory exactly what he was looking for, and knew he was close. There was one chance in a hundred, or a thousand—

WITH THE ATTACK of America, the world saw its doom at hand like the handwriting on the wall. Under the International League, all Earth had united in the effort to save itself. Its main hope lay with the scientists and their prodigious efforts to rearm a world that had not manufactured a gun in the past generation.

It was a bitter, ironical thought that if the enemy had attacked a half century before, when the world had been a great armed camp, the outcome would not have been so questionable. The red enemy ships over any city at that time would have touched off a furious belching of powerful guns. Guns whose trained crews could pick off invisible specks in the stratosphere. Great fleets

of man-made eagles there had been which would have harassed the enemy, out of the sky. Giant cannon whose bombs exploded in the air, ripping anything within a mile to shreds, developed as defence against aerial attack.

And, then there had been the mysterious Vorday gun, believed to, have utilized atomic power. Its inventor, Henri Vorday, perhaps the greatest genius of the age, had built only one and set it up in the heart of the city he lived in. Through twenty years of war, that city had remained untouched. For whenever enemy craft had appeared, a frightful, ravening force from the Vorday gun had disintegrated them to invaluable dust.

With a wisdom equalling his genius, Henri Vorday had not distributed the plans for his superweapons, not even to his countrymen. In the post-war rise of pacifism, he had wrecked the gun and burned all plans. He had come to an untimely death a few weeks later, with a dozen others, in a midocean fall of a strato-liner.

Particularly would the Vorday-gun have been a godsend now—fire against fire! For it was plain that the enemy had atomic energy. Their ships sent down the horrific violet beam, hour after hour without letup. Only the cheap, endless energies of atomic matter itself could supply such steady power.

But Earth had nothing, whether Vorday-gun, cannon or even hand-pistol. An entire new armament had to be designed and put into action in desperate haste—untried, unproven. When the first crop of new weapons appeared in Europe, they proved almost useless. Machine guns, mounted on fast commercial aircraft, jammed hopelessly after the first burst of fire. Antiaircraft guns burst after the first few shots, maiming and killing their crews. Cannon belched out one shell—and remained silent, with split breeches.

Earth did not know how to manu-

facture weapons! But Earth did not give up. Each mistake was pounced upon, corrected. Engineers and technicians accumulated experience. The world's vast industrial organization ground out, overnight, crops of weapons, each superior to the last. Men were rapidly trained in their use and rushed to strategic cities. A hopeless situation showed faint promise of betterment. Soon would come a decisive struggle between Earth's new armament and the demonic powers of the aliens from space.

In the meantime, the enemy continued its slaughter. With devilish thoroughness they carried on their apparent aim to decimate all Earth. They made no attempt to communicate with mankind. No one knew where their ships came from, or where they had a base. With daily, maddening regularity the silent, crimson ships appeared over large cities all over the world and burned them to the ground with their atomic flames. In a month the toll had reached tens of millions of lives, and an incalculable amount of property.

Many of the cities last destroyed had been partially evacuated. Most other large cities not yet attacked would be evacuated almost entirely. Crews of factory workers, turning out munitions, were ready at a moment's notice to leave. Guns were set up, waiting for the enemy to strike.

Earth prepared for a decisive last stand—

HAGGARD from three days of unremitting toil, young Professor Harvey Carmichael cursed for the need of an assistant as he attempted to attune twin resonators while watching five meters register fleeting dissonances that he must weed out. He flung himself away nervously. He looked at his trembling hands and realized the news he had heard over the radio an hour before had unnerved him. The news that Boston

had been attacked by the aliens.

Boston, the city he had always lived in and in which his parents had lived before their death. For the first time the full meaning of what a city's destruction meant to those living in it struck him. He went out on the back steps and saw a horrible red glow on the horizon—the flames that were eating the city. It seemed a flame eating into his vitals. He cursed the aliens—cursed them—

And Tanya! Suppose she were un-

you in your work. I see your viewpoint. It's a strange, distorted viewpoint—science above humanity—but I think I see it. Do you want me to stay—"

She stared, breathlessly, at this man whose innermost thoughts she had never fathomed. He nodded and two souls were at peace with one another.

Inside, with his head on her lap, she laughed a little hysterically. "How strange it will be," she said. "Out there—the whole world battling an alien menace. Here—you and I, going on with



able to escape? "Suppose the aliens destroyed her, too? She, and his work, had been the only things he loved. Would she die condemning him to ~~the~~ last as a renegade to his own race—?

Dully he noticed a car turning into the driveway. A white figure stepped out and ran to him.

"Tanya!" he whispered unbelievably.

Livid terror shone in her eyes. "The burning of Boston—Harvey—it's horrible!" Her voice shook uncontrollably as she described what she had seen, until at last she had talked the terror out of her system.

She hesitated, then went on in a small voice. "Harvey, I've come here to help

scientific work that may never—"

She caught herself. "Harvey, just what is your work? You've told me so little of it."

With an effort he spoke. "There is one chance in a hundred, or a thousand—" His voice trailed away. Tanya waited for him to go on, but when she looked down, his eyes were closed. He had not slept, or eaten, for three days.

"My theory," explained Carmichael, the next day, "is that vibrations in the ether expand both outward and inward from the point of propagation!"

"Yes, I remember you saying that before." Tanya looked again at the queer

apparatus, without knowing in the least what it was meant to do. "And that your work for two years has been in that field. But can you explain it more fully?"

"Classical theory," began Carmichael, "states that from the point of propagation, a uniformly growing sphere of wave-energy starts and expands into the sidereal cosmos. Traveling at the speed of light, the sphere includes the solar system in a few hours. In four years, its outer surface has included Proxima Centauri, the nearest star. An age later, the sphere is a tremendous thing that has engulfed all the Milky Way Galaxy and is bulging out toward the island universes."

The girl nodded. "So far it's clear."

"But that is only half the picture," pursued the young scientist, the words tumbling out eagerly. "Classical science fails to take account of the inward propagation of electromagnetic waves—into the microcosmos! Within the atom are to be found the identical sets of vibrations that fill the outer universe. Here a curious thing results. Relativity indicates that the time system of the microcosmos is as different from ours as its dimensions. The contracting sphere takes as long to reach the absolute zero of dimension, as the expanding sphere in the macrocosmos takes to plumb infinity."

"I think I follow you," said Tanya hesitantly. "Except—what's to be done with it?"

"Plenty," assured Carmichael. "Visionaries have often pictured rocketing out into space at greater than the speed of light—if such a thing were possible—and catching up with light rays that left Earth centuries, or ages, ago. They would observe the visual record of Earth's history at first hand. But we cannot go faster than light. Yet what about the same etheric records that exist within the atom? They are available!"

The young scientist's voice became a sharp hiss. "Within the atoms of all the matter around us lie the records of the past, in the form of ether vibrations.

An instrument that can reach down within the atom and translate those vibrations into visible light waves would make the past an open book. In plain words—television of the past!"

TANYA, womanlike, tried to hide the deep admiration in her eyes as she looked at the man she loved. She made her voice casual. "And you have done that, Harvey? Delved into the past?"

"In a measure, yes," he replied, waving a hand toward the hybrid apparatus on the worktable. "There's the micro-oscillator—I call it my subatomic eye—connected with a television-circuit. Resonance is the key to it, as it is to all television mechanism. This apparatus is made to explore deep within the atom. Its resonator can attune itself to the miniature spheres of radiation that started at the atom's surface years—even ages—ago, and are still plumb the infinite smallness."

"But the atoms dance!" exclaimed Tanya suddenly. "How can you tune to anything inside a dancing, whirling atom?"

Carmichael smiled a bit patronizingly. "I don't just probe within a single atom, but into millions. By the law of averages alone, in the hordes of countless atoms, millions are alike. Look, here is a glass of sea-water, right from the Atlantic. In it are so many atoms that the number is meaningless. If this glassful were poured back into the ocean, in a few years every glassful of water in the world would contain millions of these particular atoms!"

He poured some of the water from the glass into the target cup of platinum.

"When I focus my tuned-radiation into the target cup to any certain layer of atoms; at least one atom of the same category is there all the time. That is the principle of statistics, the same system of mass action by which insurance companies assure themselves of an equilibrium among great numbers."

He frowned then. "Still, it isn't as easy as all that. I need greater selectivity. Each time I move my tuned

beam slightly, I intersect hundreds of atomic orbits. So far, on the screen, I've only been able to get superimposed pictures of the past—look, I'll show you."

He fingered the various controls of his subatomic eye. After a moment he turned off the room's lights, and the television screen at the side suddenly came to life. Its surface sheen reflected prismatic patterns that changed with the swiftness of a whirling kaleidoscope. The interplay of light and shadow solidified in form and substance.

Michael shifted a vernier and the pictures clarified, but dissolved rapidly into one another. Drab coasts, fleecy clouds, strange underwater fish, towering jungles, enigmatic hairy figures and man-made structures flitted evanescently across the screen, all in an insane jumble.

The lights came on again to reveal unimpaired impatience on the young scientist's face. He ran fingers through his hair. "To have gone this far and be balked—"

Tanya stood up, went to him comfortingly. "You'll overcome it, Harvey. And I'll help as much as I can if you—"

"I can use help," he said gratefully. "Come on, let's get busy. First—"

"First," interjected Tanya, "will you do me a great favor, dear? It would mean so much to me if you gave me your ring back. I was a fool for the way I acted that night."

He stared at her blankly for a moment, then fumbled in his vest pocket. Pulling out the ring, he extended it toward her. Just as she was about to take it, he drew it back suddenly. He turned it over several times, staring.

"That's it!" he exclaimed finally. "Why didn't I think of it before? Diamond separates different wave lengths of light. It can do the same for my tuned radiation—sharpen its focus!"

He turned to her. "Do you mind?" he asked perfunctorily. In another moment he had plucked the diamond from its setting with pliers, and began making a cradle for it with fine quartz threads.

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ward to, this battle to the finish with the ruthless aliens. With normal industry paralyzed, famine and shortages of all kinds faced the world. In places, mobs began to get out of hand.

The bitter struggle went on, while civilization slowly crumbled—

MANY strange scenes of the past were pictured with pristine clarity on the telescreen that was motivated by Carmichael's subatomic eye.

"Thanks to your diamond," Carmichael said, "the scenes are not overlapping." His eyes shone. "The past! Revealed to man! There is no limit to the range. It can reach back and view the great world events. The last war, the discovery of America, the building of the pyramids, the prehistoric world, the sinking of Atlantis. All things are indelibly recorded within the atom."

Tanya smiled wanly. "But what's the use of it—now?" she said tonelessly. Though isolated from the world's bedlam, she could not be wholly indifferent to it. Radio reports were scattered and infrequent, but were packed with frightful import.

Carmichael went on as though he had not heard. "Suppose now I'm looking for a definite event. There is one chance in a hundred, or a thousand, of finding it."

"Is there even that much chance?" asked Tanya, appalled at the thought of examining microscopically all that had been in the immense past. "There are ages and ages—"

"Wait a minute," interrupted Carmichael, smiling. "It isn't as bad as that. I've eliminated the worst odds. I can project my subatomic eye to the exact position within the atom at which to find any certain time period. In fact, I have the chronology of it down to the fraction of a second. Here's how I've figured my chances.

"No two events in the entire history of Earth have occurred at exactly the same time! Think of seconds and then hundredths of seconds, and then millionths and then millionths of those. You see that at the precise moment any

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one thing happens, it is such a small fraction of time that millions of other things can happen just before and just after—and all in the space of a second.

"But, the full occurrence of any one thing—say of a strato-ship falling into the Atlantic—overlaps into many seconds. Therefore, the record of it is spread into millions upon millions of split seconds, in countless atoms. My formulae show that of every thousand atoms from the Atlantic, from one to ten will have some record of that fall into the ocean! Those are my chances!"

He arose. "That is what we'll do now—search, for a specific event. A strato-liner fell into the Atlantic on June 6, 1961, at approximately 4:00 P. M. At least, at that moment the radio operator's voice was cut off by a thunderous crash from the receiver, Tanya, you are to keep a sharp watch on the screen as I move my tuned beam from atom-group to atom-group. At the first sign of anything even remotely resembling that crash, from any viewpoint, let me know."

The lights flicked out. Carmichael manipulated his controls in the soft glow of pilot lights over the panel.

Tanya smothered a hysterical laugh. "How meaningless this is, Harvey! Here we are watching for a strato-liner's fall into the ocean thirty years ago. Outside—now—the world is—"

"Watch!" commanded Carmichael fiercely.

Tanya obeyed. Strange pictures ghosted into the screen, sharpened, and finally faded as Carmichael's eye of the past probed within the atoms of seawater contained in the cup-shaped target of platinum. Pictures that in the main had little meaning. Many were simply panoramas of sky, sea or cliffs. Now and then, aircraft and ships at a distance.

AT RARE INTERVALS in the next few hours, close-ups of human figures mirrored on the screen. One scene, aboard a fishing schooner, showed a group of men frantically hauling down canvas before a storm. Since the view

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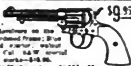
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total numbers. At the International League headquarters in Switzerland, the leaders talked of new guns; but with hopeless looks in their eyes. Earth had been caught unawares. The result had been inevitable from the first.

Secret discussions were held as to how best to contact the enemy and surrender—if they would accept surrender. Perhaps their sole aim was to destroy mankind to the last one!

Fighting back automatically as best it could, Earth waited for its doom—

In Carmichael's laboratory, the silent telescreen showed the interior of the ill-fated strato-ship, at odd angles that changed often. The passengers were sitting quietly, some reading, some staring out of the windows. Suddenly there was a jerk. The passengers sprang up in alarm, looked around wildly. Smoke drifted past the windows. The cabin dipped, passengers fell, their faces distorted in panic. Finally a wrenching of the whole scene—and then a green murkiness flooding everything.

As though it were a motion picture, Carmichael re-ran the scene three times. Then he straightened up. "That's what I want!" His voice held triumph, but behind that something else—thankfulness.

TANYA'S nerves exploded. "But, Harvey, it means nothing!" she half-shrieked. "Here we've slaved for a month to prove that your machine can pick out events in the past—and there is no future! The radio report this morning stated that the IL has been trying for three days to establish radio communication with the aliens without success. They want to surrender and stop the terrific slaughter, but—"

"They must not do that!" cried Carmichael. "Must not surrender. That would mean slavery for mankind!"

"And what alternative is there, besides universal extinction?"

He grabbed the girl and shook her. "Listen, Tanya! That ship we saw fall was the ship in which Henri Vorday met his death. Henri Vorday was the greatest scientific genius in history,

He set a table facing the telescreen and arranged two chairs. He supplied himself with paper and several sharpened pencils.

"We're going to copy everything we see in that book," he said grimly. "It represents thirty years of research by a laboratory genius. It represents atomic power! And a weapon with which to fight the aliens!"

As the scenes started again, Tanya found it hard to believe that what they were seeing was contained in the dancing atoms under the tuned beam. In a glass of ordinary sea-water! Then she bent over her typewriter as the first page of the notebook was revealed.

It was hard work. The writing in the book was not always distinct, nor easy to decipher. At times the scene shifted crazily. At times only the back of the book could be seen. The atom's eye view of the ring obeyed no law. But what they could make out, they recorded. Tanya knew French well enough to intuitively guess where she couldn't decipher. And Carmichael's mathematical brain readily interpreted the symbols and formulae his eyes saw only hazily.

They ran over the record five times, correcting and adding, till no more could be done with that particular path into the past. They had worked without sleep thirty hours. Tanya had kept coffee warm on the electric griddle.

"Done!" said Carmichael finally. He rose, trembling.

"Do we have—what we need?" asked Tanya.

"Do we?" roared Carmichael jubilantly. "We have enough here to blast the aliens into the next dimension!"

"If it isn't too late!" Tanya murmured. She snapped on the radio, tuned for news. But there wasn't any news, nor any sound in the ether. A blanket of silence lay over Earth. The last threads of official communication had been broken!

Carmichael went swiftly to the short-wave set in the corner, sent power into its tubes, and tuned for the IL's private wave-band.

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day's gun, and the atomic power with which to run it. I'm going to transmit the detailed plans and formulae to you and you'll rebroadcast them to all Earth. Wherever there are a group of scientists and engineers and a factory, this weapon must be turned out. Do you hear me?"

"Good Lord, Carmichael, are you sure——"

"Of course, you fool! Don't waste time!"

"All right, Carmichael!" returned the voice, with a half-skeptical hope in it. "It can't do any harm."

Carmichael gathered all the typewritten sheets and penciled formulae before him. "Here goes!" he yelled. "The fifth energy level of the atom is reached by this formula——"

On and on his voice droned, hour after hour. Tanya brought him water and coffee and encouraged him with her eyes. Carmichael's voice vibrated in the sensitive tubes of the Alp station, and from thence radiated to every corner of Earth. Many a dazed mind and dulled eye, waiting for an inexorable doom, snapped to clarity, hearing his message.

"Bend your every effort to this," rasped Carmichael's rag of voice toward the end. "Mount these small projectors on any and all aircraft available—on anything that flies!—and soar out to meet the enemy. You have a weapon at least as powerful as theirs. Many of you will be destroyed, but others of you

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BUILDING UP YOUR
**ALKALINE
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HELPS YOU TO
RESIST COLDS

From a MEDICAL JOURNAL: "The researches (of these doctors) led them to believe that colds result from an acid condition. To overcome this, they prescribe various alkalies."

Please mention this magazine when answering advertisements

will succeed. The red ships will fall to the last one—"

Five red ships appeared over a city somewhere on Earth and began razing it to the ground with their all-consuming purple beams. They were carrying on a program that had already wiped out the largest cities, and would eventually destroy the smallest. Something appeared over the horizon—a fleet of Earth craft. The red ships took no notice.

Suddenly a bright violet beam stabbed from among the approaching fleet. One of the red ships sagged in the middle, broke into two parts, and crashed into the ground. The other four ships swung their purple beams upward into the swarming attackers.

Scores of Earth craft fell. But another red ship crumpled. Then another and another. The remaining crimson ships sought escape, dashed for the clouds. But more Earth ships, like angry hornets, waited for them there. The last red ship fell—

"—and Earth will be free of its dream!"

"O. K., Carmichael. O. K.," came the voice from the Alps. "We have made an electro-recording of your message and will broadcast it continuously, over and over. I hope this is the thing we need to give those—"

Carmichael, with a hasty glance at Tanya, snapped off the radio to cut off the vigorous language that followed. But Tanya was smiling.

Heavy elements are not necessarily inert.

ALTHOUGH most of the heavy metals—gold, platinum and the like—are extremely inert chemically, that is not true of heavy metals in general, though it is frequently assumed. Uranium, for instance, the heaviest of known, reasonably stable elements, far from being platinumlike in activity, is voraciously active! The metal itself is white, silvery, and extremely heavy, nearly twice as dense as lead. It is not a soft metal, however, as are most of the heavy elements, but definitely hard. However—it is so active, that, like sodium and calcium metals, it reacts vigorously with cold water.

Radium metal on the other hand, although almost as "heavy" in the atomic weight sense is lighter in specific gravity than iron. But chemically, it behaves toward water more vigorously even than calcium. Tungsten metal, another metal almost twice as dense as lead, is of course used in incandescent lamps because of its high melting point. But—weight for weight, tungsten is stronger than the far lighter aluminum. Tungsten is, in fact, possessed of the highest tensile strength known among elements. But it, too, is chemically, strongly active. It dissolves readily and swiftly in acids, oxidizes easily, and cannot practically be exposed to sea-coast air.

Platinum itself is far from being the most resistant metal, chemically speaking. It dissolves readily and rapidly in fused sodium carbonate, is attacked by sooty flames, and by the familiar aqua regia. A solution of chlorine in water attacks both platinum and gold readily. On the other hand, iridium metal, a member of the platinum group, is absolutely unaffected by aqua regia, sodium carbonate or sooty flame. So resistant is iridium in fact that nuggets of it, found associated with platinum in deposits, almost defy solution for chemical analysis. The only effective solvent is sodium peroxide fused at red heat. The peroxide itself is man's closest approach to the universal solvent. Fused, it will dissolve all known metals, glass, graphite, clay, or practically any substance used as a crucible!

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